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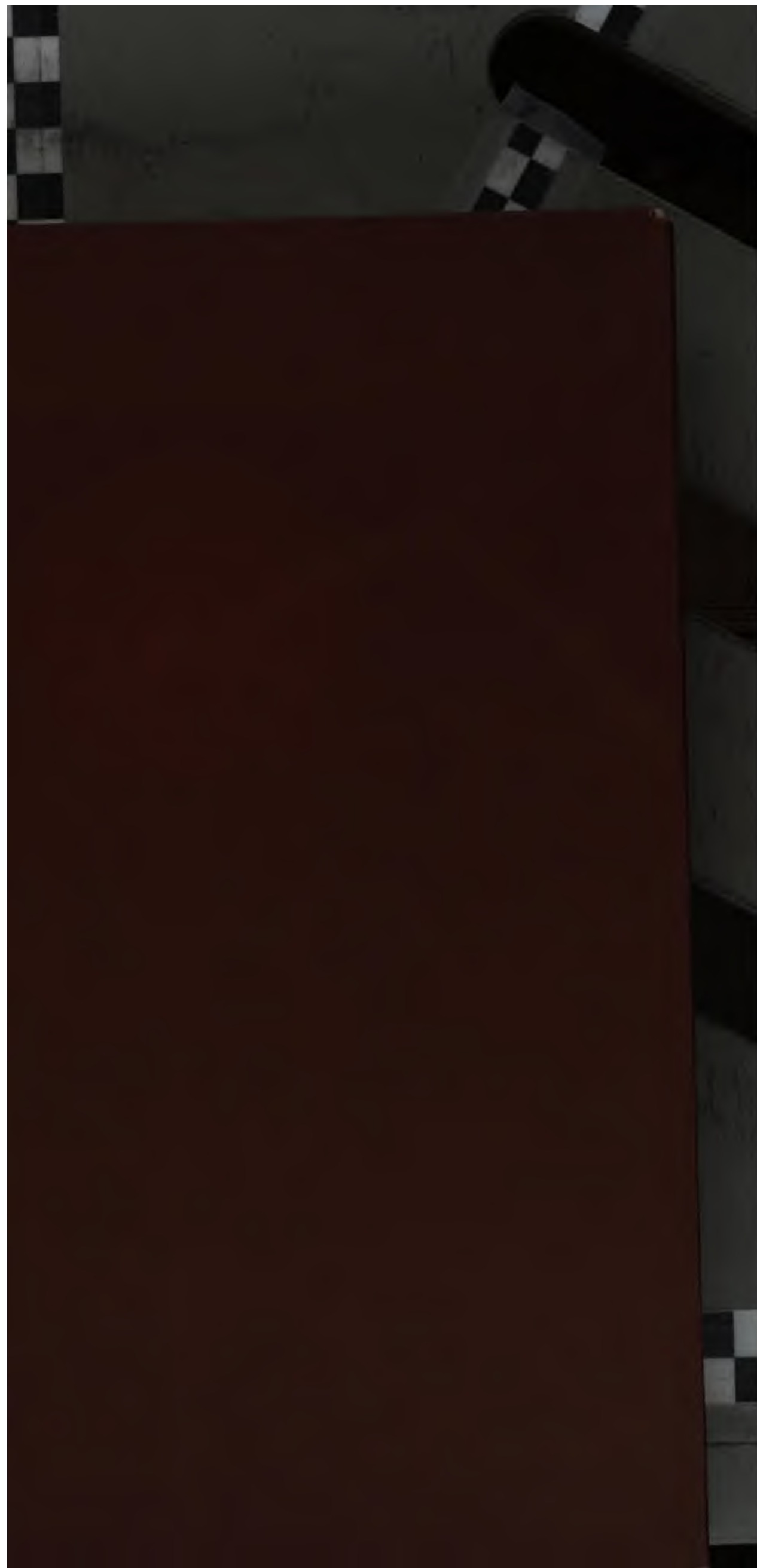
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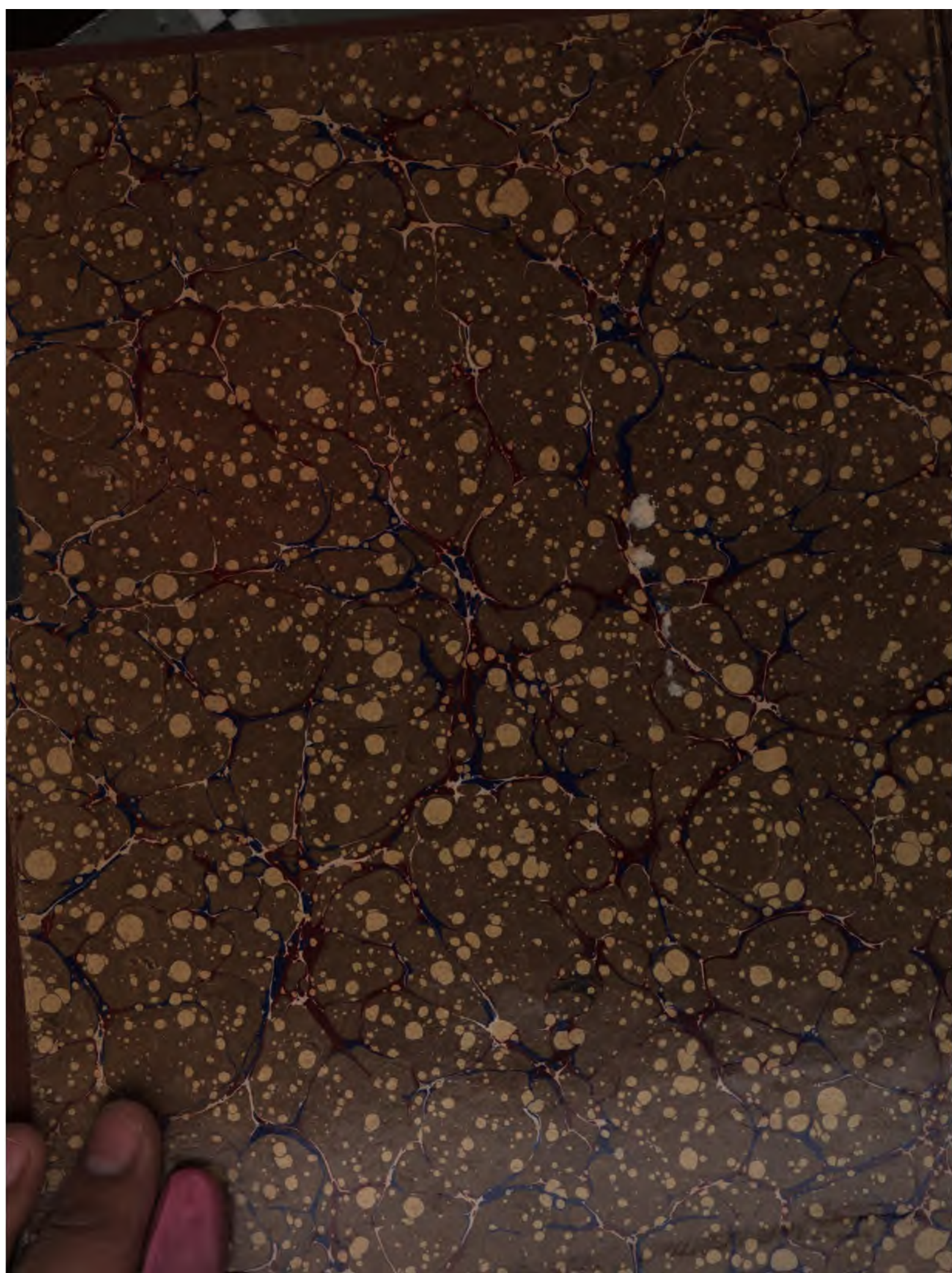
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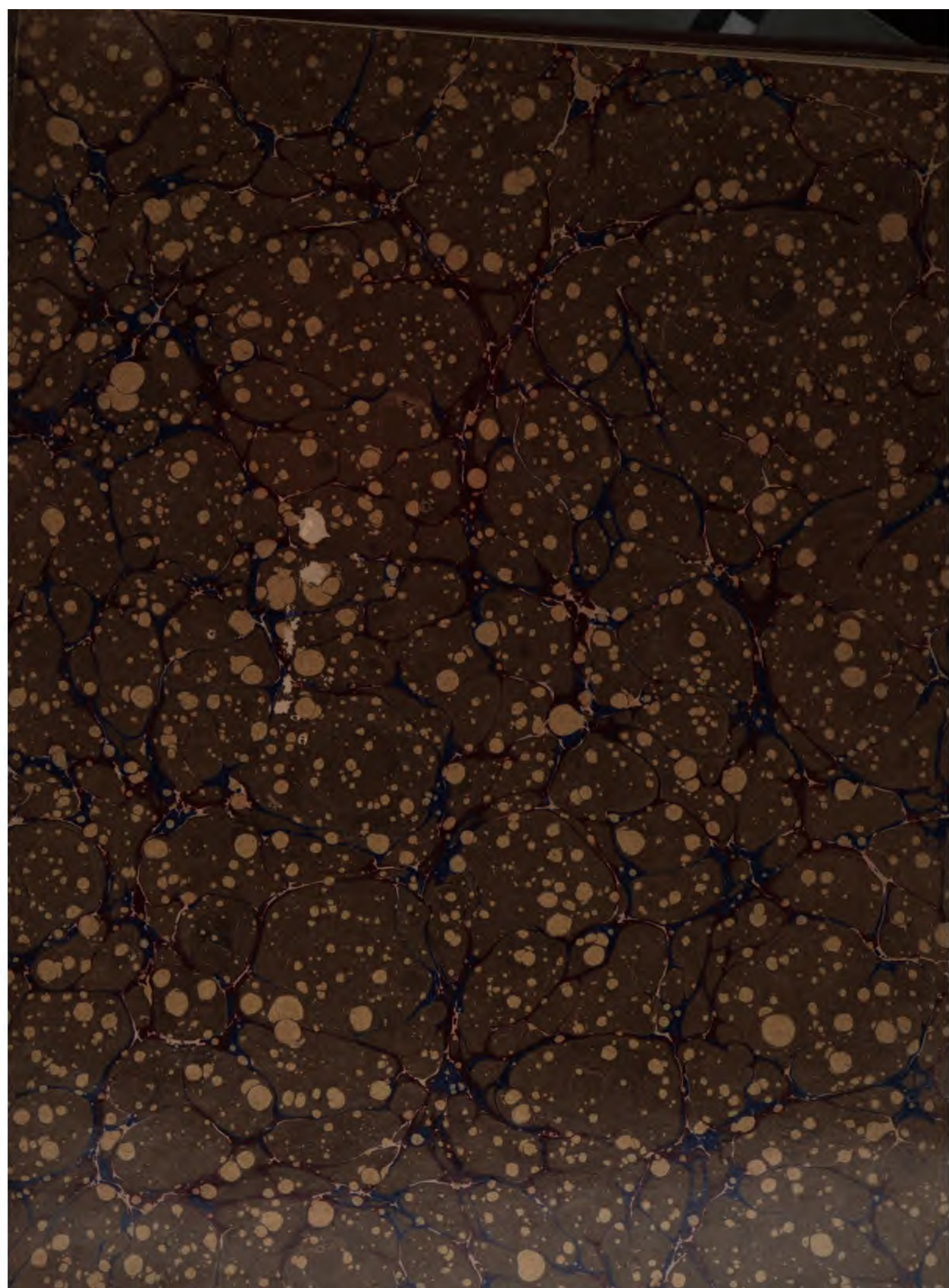
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RESEARCHES IN STELLAR PHOTOMETRY

DURING THE YEARS 1894 TO 1906

MADE CHIEFLY AT THE

YERKES OBSERVATORY

BY

JOHN A. PARKHURST, S. M.,

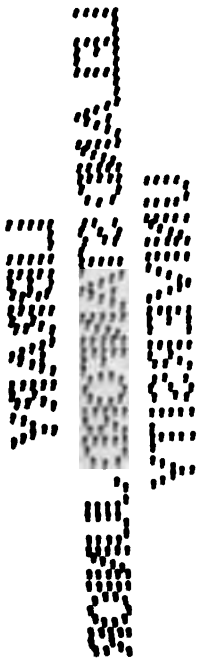
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RESEARCHES IN STELLAR PHOTOMETRY.

BY JOHN A. PARKHURST.

INTRODUCTION.

The problems of stellar photometry are closely connected with many cosmic questions, primarily with the light changes of variable stars; but they have an equally important bearing on the questions of stellar distribution and evolution. It has been said by good authorities that it is of more importance to measure the light than the place of a star, and if one considers merely the astonishing number of variable stars now being discovered, it will be admitted that the importance of stellar photometry can scarcely be overestimated. The material here submitted is the natural outgrowth of the writer's variable-star work, the plans being extended as the instrumental and other facilities were improved.

The following contribution is offered towards the solution of several photometric problems, among them being:

- (1) The accurate determination of complete light-curves of twelve variable stars of long period, having faint minima.
- (2) The question of the behavior of variable stars during their faint stages which can only be observed with the largest apertures.
- (3) The adaptation of the Pickering "equalizing wedge photometer" to the determinations of magnitudes.
- (4) The photometric measurement of very faint magnitudes, and their relation to estimates founded on the limit of visibility of different apertures of telescopes.

I wish to acknowledge here the efficient assistance rendered in the reductions by Miss Kate Bloodgood, also by Mr. F. R. Sullivan of the observatory staff, who recorded all the photometric measures made with the 40-inch telescope.

HISTORICAL.

The writer's variable-star work began at Marengo, Illinois, in May, 1893, with visual comparisons by Argelander's method of a list of long-period variables, including at first the circumpolar stars in Professor E. C. Pickering's pamphlet, "*Variable Stars of Long Period*," published in 1891; with additions, from time to time, of new variables which were not receiving sufficient attention elsewhere. By the end of 1899 the number of observations amounted to about 5,000, furnishing data for determining 162 maxima and 116 minima. Provisional results were published in the *Astronomical Journal*, vols. 13 to 21, and in *Popular Astronomy*, vols. 2 to 8. This work was made possible largely by the kind assistance of P. S. Yendell, of Dorchester, Massachusetts, who with great patience gave the instructions needed by a beginner and corrected the errors into which one was so likely to fall; also of Henry M. Parkhurst, of Brooklyn, New York, who, beside

other assistance, made photographic copies of the forty *Durchmusterung* charts, then out of print, making possible the finding of the newer variables and the identification of the brighter comparison stars; and of Prof. E. C. Pickering, who furnished charts and photometric magnitudes of many of the comparison stars.

The instrument used so far was a 6.5-inch reflector by Brashear, but connection with the Yerkes Observatory for three months in 1898 and since January, 1900, has made possible the extension of the work to the determination of the minima of very faint stars, fixing the photometric magnitudes of the stars used for comparison, and making photographic charts of the fields surrounding the variables.

PLAN OF WORK.

Two points were determined from the start: (1) To follow the variables as far as possible throughout their period; (2) to give special attention to the positions and identifications of the comparison stars. To carry out the first point, preference was given to circumpolar stars, which could be followed the year around. To fulfill point 2, the coordinates of the comparison stars from the variable were measured with a filar position micrometer, at first on the 6-inch, afterwards for twenty fields with the 40-inch for the faint stars. The completion of the 24-inch reflector in 1901 made it possible to accomplish this object much easier and better by photography, so beginning in November of that year plates were taken to show the faintest comparison stars used.

The addition of the Pickering equalizing wedge photometer to the outfit in 1900 made it possible to complete the plan of work by adding (3) the determination of the photometric magnitudes of the comparison stars, based on standard stars which had been measured both at Harvard and Potsdam. The publication of the Harvard catalogue and the approaching completion of the Potsdam work, including all stars north of the equator to magnitude 7.5, furnished the basis for this work, but it did more than that; it called for a minute comparison of the two magnitude systems in conditions of practical work. It is not enough to know the average differences between the two systems; the practical question is, What systematic differences will be found in standards selected for a particular field? To anticipate the results discussed in Chapter XIV it may be stated here that the irregularities found in the systematic differences leave an outstanding uncertainty of about 0.1 magnitude in stars as bright as 7.0.

ESSENTIALS FOR GOOD VISUAL COMPARISONS.

Among the precautions kept in mind to insure good visual comparisons, the following were foremost:

(1) The two stars to be compared were made parallel to the line of the eyes. To the writer this precaution was of the utmost importance, for if two equal stars were placed in a vertical line the lower would appear more than half a magnitude the brighter. The required position of the stars was easily secured with the 6-inch reflector by turning the tube in its cradle.

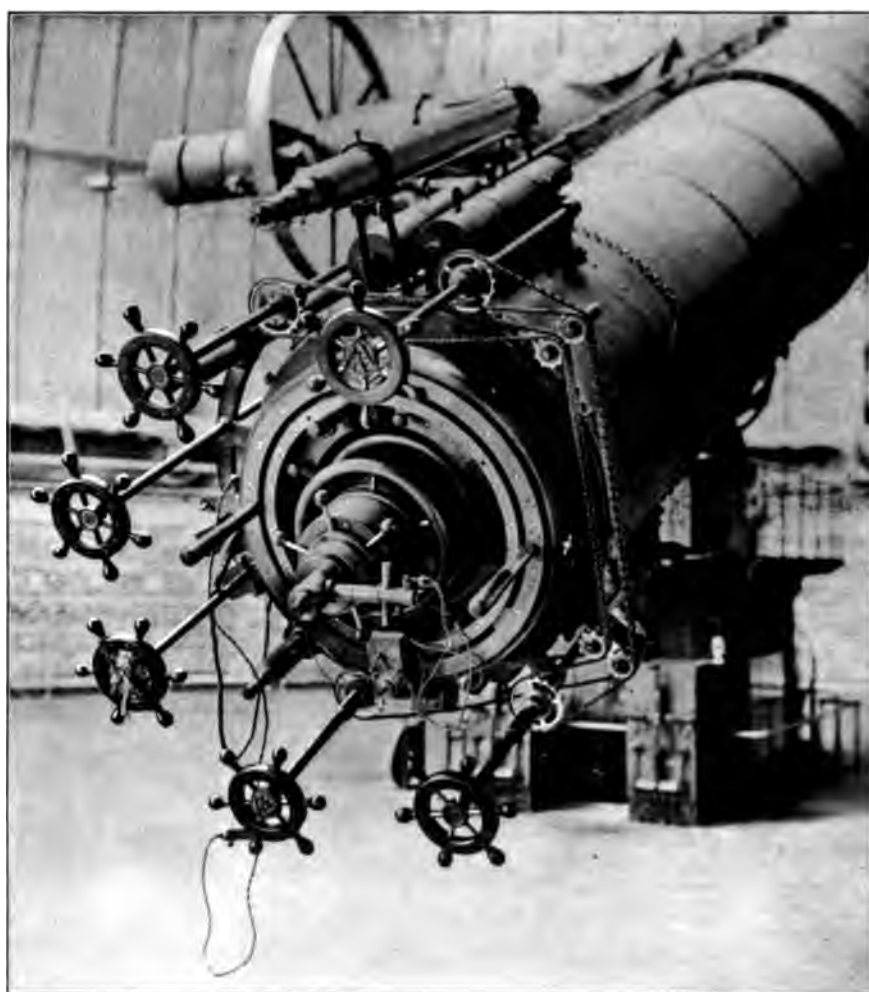
(2) Two or three comparison stars were used at each observation if they could be found in proper distances and magnitudes, though this rule often conflicted with the two following.

- (3) The stars to be compared should be in the same field, and
- (4) The interval in brightness should be less than half a magnitude. If this limit was exceeded the comparisons were weighted in the reductions, inversely as the interval.
- (5) Prejudice which would arise from anticipating the star's expected changes, was avoided by postponing the reductions till the maximum or minimum was completed. The observing list was long enough so that the previous observations were usually forgotten at the time of a comparison.
- (6) The comparison of too bright stars was avoided by reducing the aperture when necessary.
- (7) Light in the eyes was avoided by using for recording a one-candlepower incandescent lamp, so shielded as to illuminate faintly a circle one or two inches in diameter on the record book.

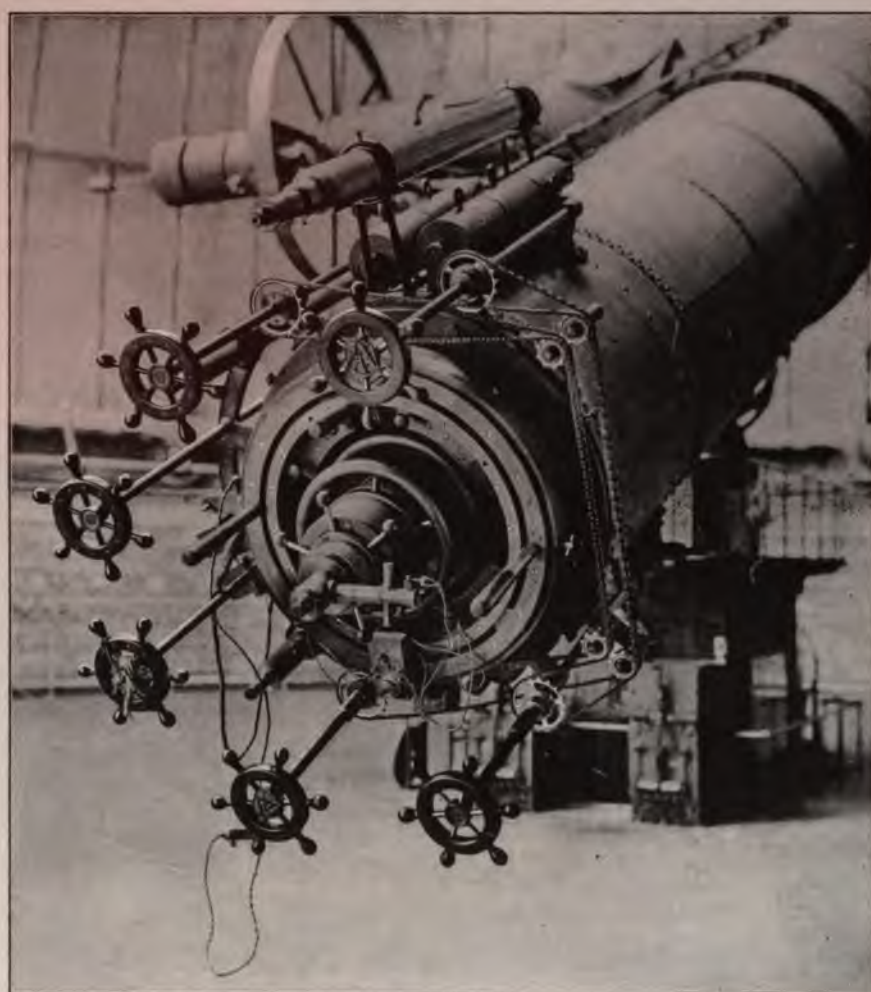
ESSENTIALS FOR GOOD PHOTOMETER MEASURES.

Experience taught the necessity of close adherence to the following principles:

- (1) A sky free from clouds and of uniform transparency is the prime requisite. A "patchy" sky is a signal to stop photometric work. All observers agree to this in theory, but their adherence to it is a variable quantity, yet it is doubtless the largest single factor affecting the quality of the work. According to my experience a lack of transparency amounting to a perceptible haziness is liable to introduce a systematic error in the night's measures. This is not the "local" error entering when distant regions, like polar and equatorial, are compared; but it shows in measures of a field limited to one degree in diameter.
- (2) Measures of a field should be repeated immediately, in inverse order from the first set, to eliminate progressive changes (*a*) in the transparency of the air and (*b*) in the brightness of the artificial star. Under (*a*), at least in the climate of the northern Middle States, progressive change in the transparency of the air is to be expected from hour to hour, and I suspect that this is true in all except a few favored regions. Admitting this, the duty of repetition in inverse order follows. The neglect of this apparently obvious precaution in most photometric work is difficult to explain or justify.
- (3) The real and artificial stars should resemble each other closely. This was possible in the present work with the 6- and 12-inch telescopes, the stars being usually indistinguishable, but it was not always possible with the 40-inch.
- (4) The stars to be compared should be in a uniform relative position. The practice of the writer has been to place them in a horizontal line, with the real star to the left of the artificial, and distant about 0.4 the space between the two images of the artificial star. Following the principle mentioned under (1) in "Visual comparisons" this uniform position seemed preferable to the four recommended by Professor Ceraski.
- (5) Nothing but the photometer lamp should be in the circuit from the storage cell supplying the current, and there should be no sliding contacts in the circuit; all should be soldered or screwed. The lamp should burn very nearly at its specified candlepower.



EQUALIZING WEDGE PHOTOMETER ON 40-INCH TELESCOPE.



EQUALIZING WEDGE PHOTOMETER ON 40-INCH TELESCOPE.

CHAPTER I.

INSTRUMENTS.

The visual and photometric work was done with three different telescopes, of 6, 12 and 40 inches aperture, thus making it possible to follow the variable stars throughout their cycles, and to measure the magnitudes of all the comparison stars needed. The lack of homogeneity in the visual comparisons, resulting from the use of such different apertures, could not be avoided, but its harmful effect was kept within limits by the use of the photometric magnitudes of the comparison stars.

The 6-inch reflecting telescope, made by Brashear, is provided with driving clock, circles (the hour circle movable), and rotating tube, making zenith observations comfortable, also making it possible to bring the line of the two stars compared parallel with the line of the eyes, a matter of prime importance in visual work. Standard stars from the Harvard and Potsdam catalogues, chosen between the 6th and 8th magnitudes, could be matched in brightness by the artificial star of the photometer. If brighter than the 7th magnitude the shade glass was used, its cell being hinged so that it could be turned into the cone of rays between the ocular and the flat. The visual limit of the 6-inch with a power of 150 is about 13.0 (see p. 10), but with the power of 40 used with the photometer it was not possible to make accurate measures of stars fainter than 11.0, while in practice the stars measured were between 8 and 10.

The 12-inch Brashear refractor and the 40-inch Clark refractor of the Yerkes Observatory need no special description. Their visual limits are about 14.5 and 17.0 magnitude, respectively. In the photometric work the greatest accuracy is secured by connecting with the 12-inch, standards between 8th and 9th magnitude with measured stars of about the 12th magnitude, then with the 40-inch to pass from the 12th magnitude to the faintest stars possible, about the 16th magnitude.

THE EQUALIZING WEDGE PHOTOMETER AND THE DETERMINATION OF THE ABSORPTION OF ITS WEDGE.

In pursuance of a plan for cooperation in determining standards for faint stellar magnitude, Prof. E. C. Pickering sent to the Yerkes Observatory in April, 1900, one of the five wedge photometers which he had devised for the work. This was to be used with the 40-inch refractor in the measurement of the faintest stars included in the plan. The construction of the instrument is shown in fig. 1 and Plate 1. The tube *T*, carrying the ocular *O*, slides into the tailpiece of the telescope. At right angles to this is the tube *C*, carrying the essential parts of the photometer. The light from a one-candlepower incandescent lamp *L* shines through a minute hole in the diaphragm *D* upon a piece of ground glass *G*, forming

an artificial star. In contact with *G* is a piece of blue glass to render the light of the star less yellow. An image of this star is thrown by the projecting lens *P* upon a plate of plane-parallel glass *B* and reflected from both surfaces into the focus of the ocular *O*, forming at *E* and *F* two images of the artificial star. Interposed in the path of these rays is the photographic wedge *W*, movable at right angles to *C* by the rack and pinion *R*. The short tube carrying the ground glass *G* is movable away from the diaphragm *D* by means of the head of the screw *S*, projecting through an inclined slot in the farther side of the tube *C*. By this means the artificial star can be made larger and less sharply defined, thus resembling more closely a real star under different atmospheric conditions. Finally, a pair of shade glasses at *A* can be moved, either both or singly, into the path of the rays.

In photometers made on this principle the all-important condition to be fulfilled is that the images of the real and artificial stars should closely resemble each other. The range of adjustment of the ground glass *G* was found to be insufficient to meet this condition with the different telescopes on which the photometer was to be used; therefore the diaphragm *D*, originally provided, which had a single aperture 0.17 mm. in diameter was replaced with a movable

diaphragm carrying four apertures, 0.10, 0.15, 0.20, and 0.25 mm. in diameter. By choosing the most suitable aperture and combining with a slight movement of the ground glass, it was possible to give the disk of the artifi-

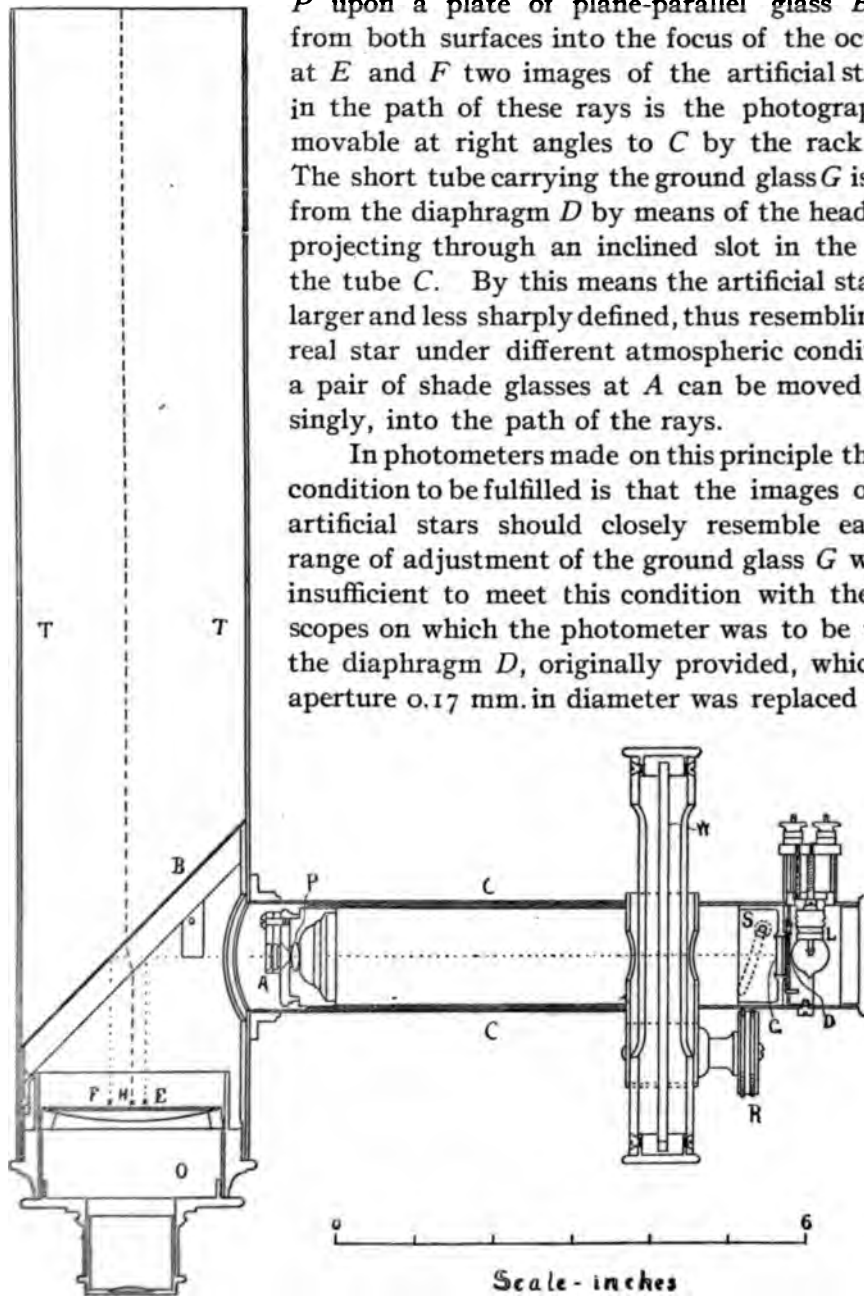


FIG. 1.—SECTION OF PHOTOMETER.

cial star any required size and sharpness to suit the various telescopes used and the different atmospheric conditions. With few exceptions the hole 0.15 was used with the 6- and 12-inch and 0.20 with the 40-inch.

In order to use the photometer with a 6.5-inch reflector, a smaller tube was provided carrying an ocular and a diagonal reflecting plate to replace *B*. After several trials good images of the real and artificial stars were given by a diagonal plate with surfaces correct to one-tenth of a wave-length, furnished by Mr. O. L. Petitdidier, of Chicago.

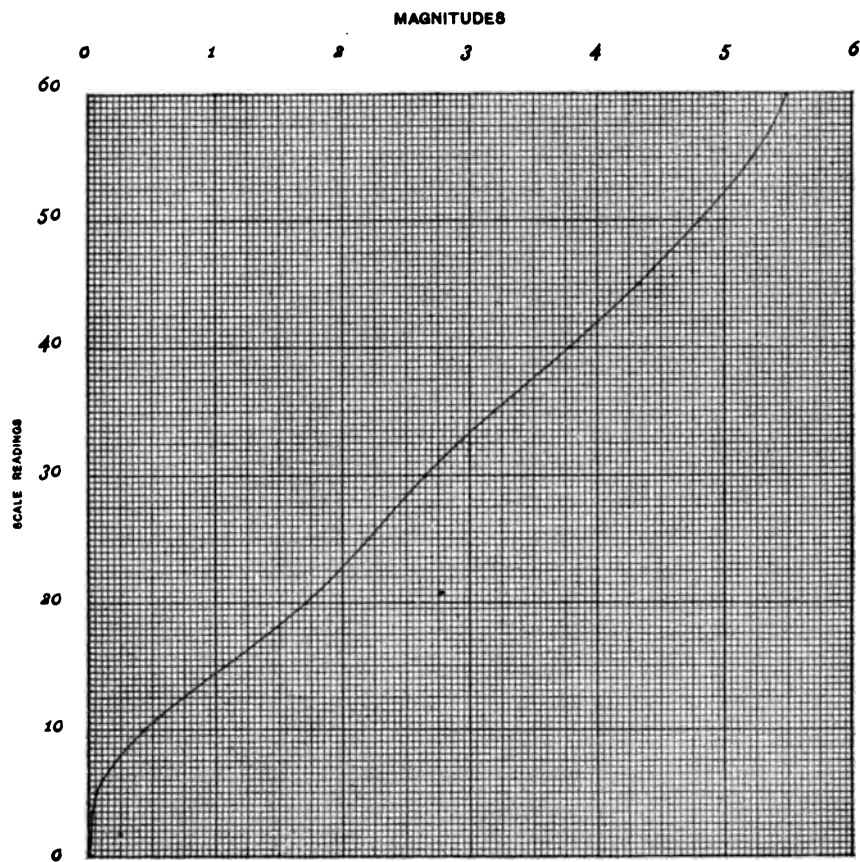


FIG. 2.—CURVE A 12. ABSORPTION OF WEDGE V ON 12- AND 40-INCH REFRACTORS.

The use of the instrument is very simple and convenient. The image of the star to be measured (shown at *H* in the drawing) is brought between the two images of the artificial star, and the wedge is moved by the pinion *R* till the light of the real star is matched by *E*, the image formed by reflection from the first surface of the plate *B*. The position of the wedge is then read on a scale divided to twenty-fifths of an inch, tenths of a division being estimated. If now the light of a star of known magnitude be measured, the only unknown quantity is the absorption of the wedge, expressed in magnitudes.

The methods available for determining the wedge absorption can be classed under two heads: (1) Measurements of standard stars whose magnitudes have been well fixed; (2) measurements of an artificial star whose light can be reduced by a known amount either by (a) polarization, (b) a revolving wheel, (c) reduced apertures by stationary diaphragms. The last method can be used either with real or artificial stars. The method by standard stars seems to give the best results, as it has the great advantage that the measurements are made under the same conditions as exist in practice.

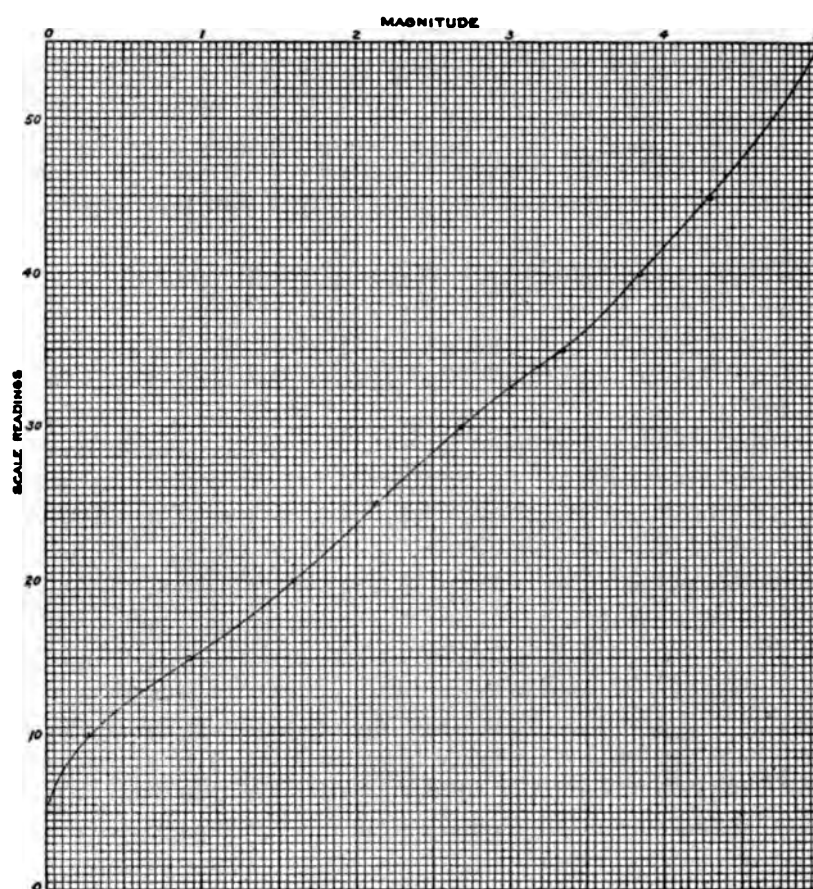


FIG. 3.—CURVE E 6. ABSORPTION OF WEDGE V ON 6-INCH REFLECTOR.

The errors which may be introduced by the neglect of this precaution are dealt with by King in *Harvard Annals*, 41, pages 237 *et seq.*, where it was found that the mean absorption corresponding to one scale division was 0.090 with the wedge almost in contact with the aperture, and 0.130 with the wedge 5 cm. from the aperture. Again, it was found by Aitken and Maddrill (*Astrophysical Journal*, 22, 147) that the absorption measured with a Lummer-Brodhun photometer, comparing surfaces, must be increased by one-quarter to equal the results obtained from stand-

ard stars. To avoid these sources of error, wedge V, which was used in nearly all the measures here considered, was calibrated by the three following methods, in all of which the wedge was placed *in situ*, and the conditions in actual practice quite exactly used¹:

- (1) Standard Pleiades stars, 2,700 settings.
- (2) Comparison with Zöllner photometer, 3,000 settings.
- (3) Comparison with "wheel" photometer, 500 settings.

Full details of this calibration will be published in connection with the work on "Determination of Standards for Faint Stellar Magnitude;" but in this connection a comparison of the results by the three methods will give the quantities used in the reductions and at the same time enable the reader to form an opinion of the degree of accuracy attained.

(1) The standard Pleiades stars were measured with both the 6- and 12-inch telescopes, and the platted measures give the absorption in the second column of Table 3.

(2) The Zöllner polarizing photometer was set up in a dark room opposite the wedge photometer, and the artificial stars compared, first by projecting the Zöllner star into the wedge, second by projecting the wedge star into the Zöllner. The mean of these closely accordant results gives the absorptions in the third column of Table 3.

(3) The wedge star was compared with an artificial star cut down by a revolving wheel provided with sectors, giving the quantities in the fourth column.

The weighted mean of these three determinations gives the values in column five, which are points in the absorption curve corresponding to the scale readings in the first column. This curve is called A 12, and is used in the reductions of the 12- and 40-inch measures.

Since another ocular and diagonal plate was used in the 6-inch measures, and the appearance of the star images, both real and artificial, was different, it was not considered allowable to assume that the absorption curve would be the same; therefore the measures of the Pleiades stars were repeated with the 6-inch and the comparison with the Zöllner photometer was made with the same arrangement of apparatus as used on the 6-inch. The absorption curve found, called E 6, is shown by column six to differ enough from A 12 to justify the separate investigation, and at the same time to confirm the general features of the curve A 12.

A few measures of faint stars were made in 1900 with wedge II, whose absorption curve derived from standard stars and the "wheel," is given by points in the last column of the table.

The question of the trustworthiness of the adopted absorption curve is of the highest importance in this work, and demands the most rigid scrutiny. The

¹ A fourth comparison with another polarizing photometer has since given identically the same absorption curve.

evidence in Table 3 may be summed up as follows: (1) The results by two independent methods, standard stars and laboratory measures, are in good agreement, the average probable error of the points platted on curve A 12 being less than ± 0.03 , with a maximum of ± 0.07 . (2) The laboratory measures were all made by matching artificial stars which closely resembled the real stars.

TABLE 3.—ABSORPTION OF WEDGES II AND V.

Scale.	Wedge V.					Wedge II.
	12-inch.				6-inch.	II c.
	Pleiades.	Zöllner.	Wheel.	A 12.	E 6.	
60	(5.80)	....	....	(5.49)	....	....
55	5.34	5.12	....	5.22	....	5.32
50	4.85	4.76	....	4.80	4.70	4.99
45	4.39	4.28	4.28	4.33	4.41	4.51
40	3.80	3.77	3.77	3.78	3.85	3.93
35	3.14	3.27	3.20	3.19	3.30	3.35
30	2.60	2.74	2.61	2.65	2.68	2.85
25	2.15	2.27	(2.18)	2.20	2.13	2.27
20	1.65	1.80	(1.74)	1.72	1.59	1.51
15	1.07	1.08	1.07	1.06	0.93	0.72
10	0.46	0.42	0.50	0.43	0.28	0.11
5	....	0.06	....	0.05	(0.00)	....
0	....	0.02	....	(0.01)	....	....

A check on the mean value of the absorption is furnished by the measured magnitudes of the stars near the limit of vision of the 6-inch telescope. Table 4 gives the field, the estimate of the limit of vision, the photometric magnitude of the limit, the correction for atmospheric extinction, and the final corrected magnitude of the limit, expressed in both the Harvard and Potsdam systems.

TABLE 4.

Field.	Limit.	Mag.		Corr.	Corr. Mag.	
		H.	P.		H.	P.
Z Cassiopeiæ	k	12.99	12.88	0.04	13.03	12.92
W Lyrae	2-3<1	12.60	12.93	0.00	12.60	12.93
S Lyrae	z	12.82	13.24	0.00	12.82	13.24
SX Cygni	3<n	12.34	12.69	0.00	12.34	12.69
RU Herculis	2<n	13.05	13.32	0.02	13.07	13.34
V Cassiopeiæ	q	12.61	12.94	0.03	12.64	12.97
Mean.....	.....	.....	.....	.....	12.75	13.01

CHAPTER II.

103 T ANDROMEDÆ.

R. A. 0h 17m 10.0s; Dec. +26° 26' 27" (1900).

The variability of this star was discovered by Anderson in 1893 and observations began soon after the receipt of the *Astronomische Nachrichten* No. 3202 containing the announcement. The literature concerning the star is given so completely in the forthcoming catalogue of the Gesellschaft committee, that it is unnecessary to repeat it here. The light changes are unusually regular, the maxima and minima being both well defined. At present the period seems to be lengthening.

The comparison stars have been measured with the photometer, the residuals being: For the catalogue stars, ± 0.03 ; for the stars measured with the 6-, 12-, and 40-inch, respectively, ± 0.08 , ± 0.09 , and ± 0.11 magnitude.

Detailed explanations follow for the tables and figures giving the photometric and visual results for this star. For the other eleven variable stars given in Chapters III to XIII explanations are only given for the few particulars in which the tables differ from those for T Andromedæ. The arrangement of the tables is as follows: First, the data for the identification of the comparison stars with a summary of the magnitude results used in the reductions, Tables 5, 6, and 7; second, the photometric measures in detail, Table 8; third, reduction constants and summary of photometric results, Tables 9 and 10; fourth, visual observations of the variable, with reductions to photometric magnitude, and residuals from the mean light-curve, Table 11; fifth, data for formation of mean light-curve, with residuals for the twelve parts of each separate curve, Table 12; sixth, observed maxima and minima, Table 13.

TABLE 5.—STANDARD MAGNITUDE STARS.

Star.	B. D. No.	1900.		Color P. DM.	Magnitude.				Residuals.		
		R. A.	Dec.		Catalogue.		Measured.		From Cats.		3 Nights inter se.
					H. C. O.	P. DM.	H.	P.	H.	P.	
	°	<i>h m s</i>	<i>° '</i>								
<i>A</i>	+25 34	0 14 10	+25 54.7	GW+	7.67	7.76	7.61	7.69	- 6	- 7	± 4
<i>B</i>	+25 29	0 13 18	+25 36.1	W+	7.21	7.42	7.47	7.55	+26	+13	± 2
<i>a</i>	+26 40	0 16 18	+26 23.7	WG+	8.20	8.12	7.98	8.06	-22	- 6	± 3
	Mean				7.69	7.77	7.69	7.77	± 18	± 9	± 3

Table 5 gives, for the standard magnitude stars, the Bonn *Durchmusterung* numbers, the position for 1900, the Potsdam color, and the catalogue magnitudes

which form the basis of the photometric work. The "H. C. O." values are taken from the Harvard Annals, 45, the "P. DM." from Potsdam Publications, vols. 9, 13 and 14. Then follow the measured magnitudes and residuals which result from Table 10, and will be considered in that connection. As all the measured magnitudes are based on these three catalogue stars it follows that the measured magnitude of each star expressed in the Potsdam system will be 0.08 greater numerically than its magnitude in the Harvard system.

TABLE 6.—COMPARISON STARS IN B. D. CATALOGUE.

Star.	B. D.		1855.		Star.	B. D.		1855.	
	No.	Mag.	R. A.	Dec.		No.	Mag.	R. A.	Dec.
	°		h m s	° ' "		°		h m s	° ' "
d	+ 26 37	8.8	0 13 33	+ 26 10.0	e	+ 26 46	9.4	0 15 47	+ 26 22.9
a	+ 26 40	7.5	0 13 58	+ 26 8.7	c	+ 26 47	9.1	0 15 50	+ 26 18.4
l	+ 25 40	9.5	0 14 19	+ 25 58.3	f	+ 26 48	9.4	0 16 10	+ 26 12.1
b	+ 26 42	8.1	0 14 27	+ 26 23.4					

Table 6. As a few of the brighter comparison stars are not within the limits of the photographic charts, Table 6 gives the B. D. numbers, magnitudes, and places for 1855 of the stars in that catalogue not in Table 5.

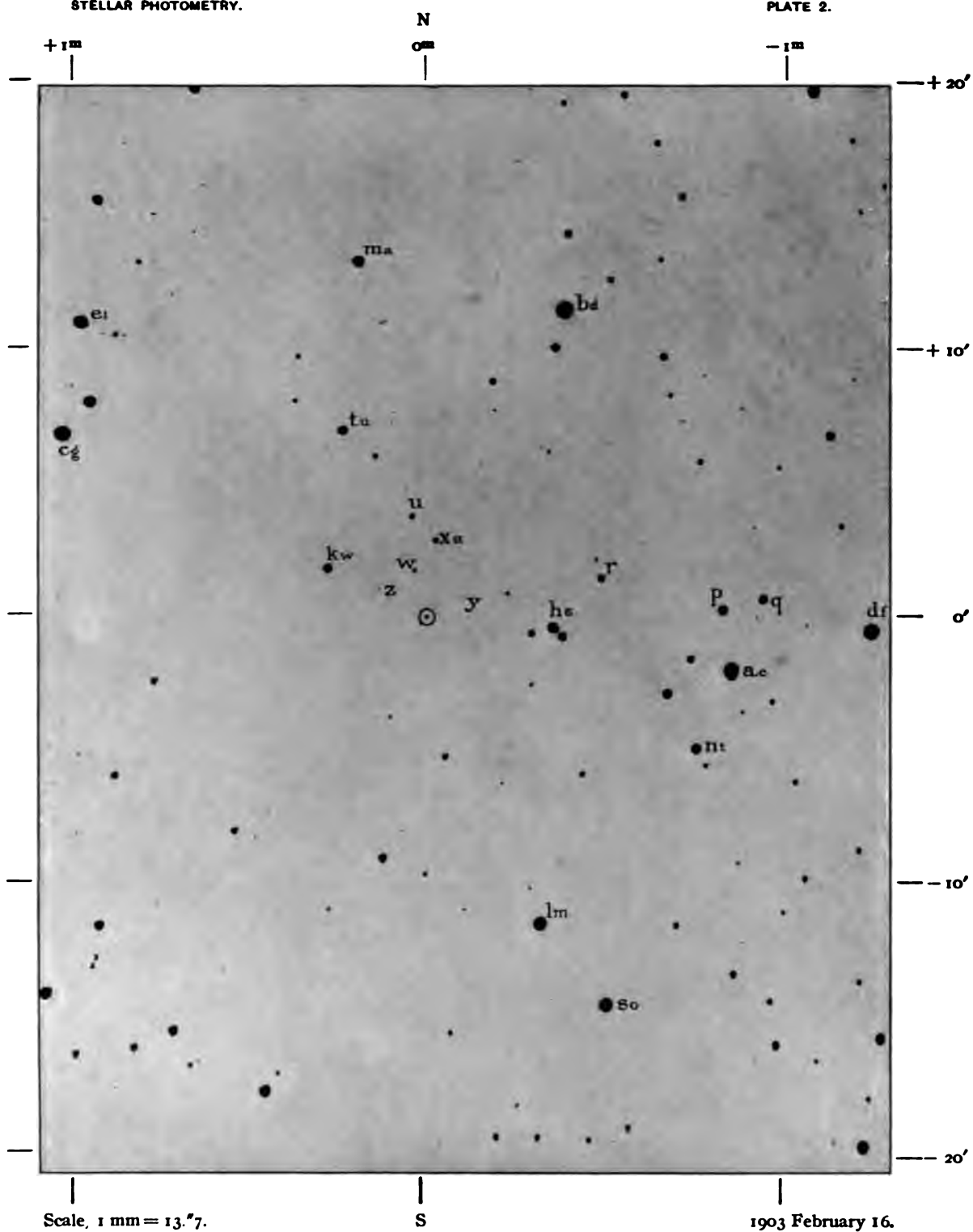
TABLE 7.—COMPARISON STARS FOR T ANDROMEDÆ (IN ORDER OF RIGHT ASCENSION).

Star.	Coordinates from Variable.			Light Scale, Steps.	Magnitude.			
	R. A.		Dec.		Measured.		From Curve.	
	"	s	"		H.	P.	H.	P.
d	— 1017	— 74.0	— 30	34.7	9.12	9.20	.....	.....
q	— 770	— 56.1	+ 41	14.3	.....	.....	12.2	12.3
a	— 698	— 50.8	— 122	42.0	7.98	8.06	.....	.....
p	— 679	— 49.4	+ 19	15.3	.....	.....	12.1	12.2
n	— 617	— 44.9	— 297	17.1	.....	.....	11.8	11.9
o	— 550	— 40.0	— 173	16.3	.....	.....	11.9	12.0
s	— 411	— 29.9	— 873	25.6	10.32	10.40	.....	.....
r	— 389	— 28.3	+ 85	10.3	.....	.....	12.8	12.9
b	— 316	— 23.0	+ 690	39.0	8.72	8.80	.....	.....
h	— 290	— 21.1	— 23	18.9	.....	.....	11.54	11.62
l	— 259	— 18.9	— 690	26.5	10.15	10.23	.....	.....
y	— 85	— 6.2	+ 44	.....	14.40	14.48	.....	.....
x	— 21	— 1.5	+ 174	10.0	13.12	13.20	.....	.....
w	+ 30	+ 2.2	+ 103	.....	13.68	13.76	.....	.....
u	+ 33	+ 2.4	+ 226	.....	13.22	13.30	.....	.....
z	+ 108	+ 7.9	+ 62	.....	14.08	14.16	.....	.....
m	+ 157	+ 11.4	+ 800	20.5	.....	.....	11.28	11.36
t	+ 196	+ 14.3	+ 420	12.3	11.66	11.74	.....	.....
k	+ 227	+ 16.5	+ 106	14.3	11.85	11.93	.....	.....
e	+ 793	+ 57.7	+ 659	30.7	10.20	10.28	.....	.....
c	+ 835	+ 60.8	+ 394	33.6	9.51	9.59	.....	.....
f	+ 1125	+ 81.9	+ 118	29.5	.....	.....	9.97	10.05

Table 7 collects the data for position and magnitude of all the comparison stars used. The second and fourth columns give the rectangular coordinates from the variable in seconds of arc; the third column expresses the R. A. coordinate

STELLAR PHOTOMETRY.

PLATE 2.



Scale, 1 mm = 13.7.

S

1903 February 16.

103 T ANDROMEDÆ.

R. A. $0^h 17^m 10^s.0$ Dec. $+26^\circ 26' 27''$, 1900.

in seconds of time. The fifth column gives the brightness of the star in steps of the light-scale, which result from the observations in Table 11, and will be explained in that connection. The last four columns give the magnitude, either "measured" with the photometer or read from the magnitude-curve (fig. 4). In each case the heading "H." indicates the Harvard, and "P." the Potsdam system.¹ The adopted values for stars measured with both 6- and 12-inch are taken from the 12-inch.

TABLE 8.—103 T ANDROMEDÆ.
PHOTOMETER MEASURES OF COMPARISON STARS.
6-INCH.

1904 October 15.			Fair to good, quiet, a little dull.						
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.		
				Mean of 3.	Mean of 6.		H.	P.	
h m 1 01	20	c	26.7 27.3 27.1	27.03	27.62	2.41	9.22	9.30	
		e	38.8 39.0 38.1	38.63	37.65	3.62	10.43	10.51	
		b	22.6 24.2 23.0	23.27	24.42	2.07	8.88	8.96	
		d	24.2 26.2 26.3	25.57	25.89	2.23	9.04	9.12	
		a	15.7 16.3 16.4	16.13	16.55	1.16	7.97	8.05	
		l	34.8 35.2 36.0	35.33	35.72	3.42	10.23	10.31	
		s	36.8 36.7 36.3	36.60	.....	3.52	10.33	10.41
		A	13.8 14.0 13.9	13.90	14.30	0.84	7.65	7.73	
		B	13.1 12.2 13.2	12.83	12.98	0.63	7.44	7.52	
		B	12.9 13.7 12.8	13.13	.....	.....	.....	.....
		A	15.1 14.0 14.0	14.70	.....	.....	.....	.....
		l	36.1 35.9 36.3	36.10	.....	.....	.....	.....
		a	16.5 17.2 17.2	16.97	.....	.....	.....	.....
		d	25.3 26.4 26.9	26.20	.....	.....	.....	.....
		b	25.8 25.8 25.1	25.57	.....	.....	.....	.....
		e	36.1 37.2 36.7	36.67	.....	.....	.....	.....
		I 24	22	c	28.3 27.8 28.5	28.20

1904 October 27.			Fine, moon rising at end.						
21 36	37	B	9.7 10.1 9.5	9.77	10.17	0.30	7.49	7.57	
		A	11.7 11.9 11.8	11.80	11.44	0.44	7.63	7.71	
		s	32.0 31.9 31.8	31.90	.....	2.92	10.11	10.19
		l	32.8 33.4 33.4	33.20	32.99	3.05	10.24	10.32	
		a	13.0 14.7 14.2	13.97	13.84	0.76	7.95	8.03	
		d	25.1 25.8 25.0	25.30	24.49	2.08	9.27	9.35	
		b	21.0 21.2 21.4	21.20	20.57	1.66	8.85	8.93	
		e	30.9 31.3 32.1	31.43	31.72	2.89	10.08	10.16	
		c	24.0 25.2 25.0	24.73	25.15	2.15	9.34	9.42	
		c	25.5 25.9 25.3	25.57	.....	.....	.....	.....
		e	32.5 31.6 31.9	32.00	.....	.....	.....	.....
		b	19.4 20.6 19.8	19.93	.....	.....	.....	.....
		d	23.2 23.3 24.5	23.67	.....	.....	.....	.....
		a	14.2 13.6 13.3	13.70	.....	.....	.....	.....
		l	32.0 33.3 33.0	32.77	.....	.....	.....	.....
		A	11.2 10.9 11.1	11.07	.....	.....	.....	.....
		21 57	34	B	9.8 11.2 10.7	10.57

¹The letters "H. C. O." and "P. DM" indicate that the magnitudes are taken directly from the respective catalogues. The letters "H." and "P." indicate measurements by the writer, expressed in the corresponding systems.

TABLE 8.—103 T ANDROMEDÆ—Continued.

1904 October 30.							Good.	
Sidereal Time. <i>h m</i>	Zen. Dist. °	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
21 00	44	<i>B</i>	11.7 11.4 11.6	11.57	10.82	0.37	7.49	7.57
		<i>A</i>	11.0 11.6 11.1	11.23	11.37	0.43	7.55	7.63
		<i>s</i>	35.0 36.0 35.3	35.43	.....	3.39	10.51	10.59
		<i>l</i>	32.9 33.8 33.1	33.27	33.15	3.07	10.19	10.27
		<i>a</i>	14.7 14.6 14.5	14.60	14.75	0.90	8.02	8.10
		<i>d</i>	25.8 25.8 25.1	25.57	25.95	2.24	9.36	9.44
		<i>b</i>	18.8 19.2 19.0	19.00	20.05	1.59	8.71	8.79
		<i>e</i>	34.0 34.0 34.1	34.03	33.62	3.13	10.25	10.33
		<i>c</i>	26.5 26.2 27.1	26.60	26.64	2.30	9.42	9.50
		<i>c</i>	26.8 26.3 26.9	26.67	.....	.....	.....	.....
		<i>e</i>	33.0 33.3 33.3	33.20	.....	.....	.....	.....
		<i>b</i>	21.3 20.7 21.3	21.10	.....	.....	.....	.....
		<i>d</i>	26.0 26.7 26.0	26.23	.....	.....	.....	.....
		<i>a</i>	14.9 15.4 14.4	14.90	.....	.....	.....	.....
		<i>l</i>	33.1 33.0 33.0	33.03	.....	.....	.....	.....
		<i>A</i>	11.6 11.8 11.1	11.50	.....	.....	.....	.....
21 24	40	<i>B</i>	9.8 10.2 10.2	10.07	.....	.....	.....	.....
1904 September 11.							12-INCH.	
							Good.	
20 23	49	<i>d</i>	15.1 14.8 16.0	15.30	15.14	1.07	9.06	9.14
		<i>b</i>	11.9 12.3 12.4	12.20	11.87	0.88	8.87	8.95
		<i>e</i>	23.5 24.8 23.9	24.03	24.72	2.17	10.16	10.24
		<i>c</i>	17.3 18.0 17.5	17.60	17.90	1.43	9.42	9.50
		<i>t</i>	39.7 39.9 40.0	39.87	39.99	3.78	11.77	11.85
		<i>k</i>	39.2 40.7 39.9	39.93	40.50	3.85	11.84	11.92
		<i>x</i>	53.8 54.7 54.3	54.27	54.32	5.17	13.16	13.24
		<i>l</i>	22.9 23.1 23.2	23.06	23.25	2.05	10.04	10.12
		<i>l</i>	23.7 22.9 23.7	23.43	.....	.....	.....	.....
		<i>x</i>	54.2 54.7 54.2	54.37	.....	.....	.....	.....
		<i>k</i>	41.1 41.7 40.9	41.23	.....	.....	.....	.....
		<i>t</i>	40.3 39.9 40.1	40.10	.....	.....	.....	.....
		<i>c</i>	17.9 19.0 17.7	18.20	.....	.....	.....	.....
		<i>e</i>	24.3 26.2 25.7	25.40	.....	.....	.....	.....
		<i>b</i>	11.8 11.1 11.7	11.53	.....	.....	.....	.....
20 48	45	<i>d</i>	15.0 14.8 15.1	14.97	.....	.....	.....	.....
1904 October 31.							Good.	
21 50	34	<i>e</i>	20.8 21.1 21.1	21.00	20.72	1.79	10.22	10.30
		<i>c</i>	15.2 16.2 16.7	16.03	15.50	1.12	9.55	9.63
		<i>t</i>	32.8 33.1 34.0	33.37	33.67	3.04	11.47	11.55
		<i>k</i>	37.6 37.3 37.6	37.50	35.94	3.29	11.72	11.80
		<i>x</i>	50.8 50.2 51.4	50.80	49.77	4.78	13.21	13.29
		<i>v</i>	36.7 37.2 37.9	37.28	.....	3.46	11.89	11.97
		<i>l</i>	22.0 21.9 21.8	21.90	21.72	1.90	10.33	10.41
		<i>d</i>	12.5 13.2 12.9	12.87	12.89	0.76	9.19	9.27
		<i>b</i>	5.4 6.6 6.7	6.23	.....	0.12	8.55	8.63
		<i>ba₁</i>	14.9 15.7 14.1	14.90	15.05	1.07	9.50	9.59
		<i>ba₁</i>	14.9 15.7 15.0	15.20	.....	.....	.....	.....
		<i>d</i>	12.9 12.9 12.9	12.90	.....	.....	.....	.....
		<i>l</i>	20.9 21.9 21.8	21.53	.....	.....	.....	.....
		<i>x</i>	47.2 49.2 49.8	48.73	.....	.....	.....	.....
		<i>k</i>	34.0 34.2 34.9	34.37	.....	.....	.....	.....
		<i>t</i>	34.2 33.7 34.0	33.97	.....	.....	.....	.....
22 18	29	<i>c</i>	14.9 15.2 14.8	14.97	.....	.....	.....	.....
		<i>e</i>	20.7 20.1 20.8	20.53	.....	.....	.....	.....

TABLE 8.—103 T ANDROMEDÆ—Continued.

1904 November 2.			Fair, a little dull, and unsteady.							
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.			
				Mean of 3.	Mean of 6.		H.	P.		
<i>h m</i> 21 30	<i>°</i> 38	<i>l</i>	28.9 29.1 29.4	29.13	30.10	2.67	10.07	10.15		
		<i>d</i>	20.3 20.3 20.3	20.30	20.27	1.74	9.14	9.22		
		<i>b</i>	16.7 16.7 16.0	16.47	16.55	1.27	8.67	8.75		
		<i>e</i>	32.2 32.0 30.8	31.67	31.54	2.82	10.22	10.30		
		<i>c</i>	25.0 25.3 24.8	25.03	24.38	2.15	9.55	9.63		
		<i>t</i>	44.2 44.7 44.8	44.57	45.15	4.35	11.75	11.83		
		<i>x</i>	60.± . . . . .	. . . . .	60.±	5.6±	13.0±	13.1±	
		<i>h</i>	47.2 47.9 47.0	47.37	47.60	4.59	11.99	12.07		
		<i>v</i>	46.0 45.9 46.5	46.13	. . . . .	4.44	11.84	11.92	
		<i>k</i>	48.2 47.7 47.6	47.83	. . . . .	. . . . .	. . . . .	. . . . .
		<i>t</i>	45.5 45.9 45.8	45.73	. . . . .	. . . . .	. . . . .	. . . . .
		<i>c</i>	23.2 24.0 24.0	23.73	. . . . .	. . . . .	. . . . .	. . . . .
		<i>e</i>	31.3 31.5 31.4	31.40	. . . . .	. . . . .	. . . . .	. . . . .
		<i>b</i>	15.9 17.2 16.8	16.63	. . . . .	. . . . .	. . . . .	. . . . .
		<i>d</i>	20.4 20.1 20.2	20.23	. . . . .	. . . . .	. . . . .	. . . . .
21 50	34	<i>l</i>	31.9 31.0 30.3	31.07	. . . . .	. . . . .	. . . . .	. . . . .
1905 January 14.			40-INCH.		Fair, unsteady.					
4 27	52	<i>l</i>	34.1 34.7 33.7	34.17	33.18	3.00	11.85	11.93		
		<i>h</i>	33.4 33.7 33.1	33.40	32.98	2.96	11.81	11.89		
		<i>z</i>	56.7 58.7 58.0	57.80	57.60	5.37	14.22	14.30		
		<i>w</i>	53.0 51.7 51.5	52.07	51.87	4.99	13.84	13.92		
		<i>v</i> ₀₁	9.5 8.4 11.1	9.67	. . . . .	0.41	9.26	9.34	
		<i>x</i>	44.3 44.5 44.9	44.57	43.28	4.13	12.98	13.06		
		<i>u</i>	47.8 46.4 45.9	46.77	46.65	4.50	13.35	13.43		
		<i>u</i>	46.7 46.2 46.7	46.53	. . . . .	. . . . .	. . . . .	. . . . .
		<i>x</i>	41.0 42.9 42.1	42.00	. . . . .	. . . . .	. . . . .	. . . . .
		<i>w</i>	51.3 51.8 51.9	51.67	. . . . .	. . . . .	. . . . .	. . . . .
		<i>z</i>	57.8 57.1 57.3	57.40	. . . . .	. . . . .	. . . . .	. . . . .
		<i>h</i>	32.5 32.7 32.4	32.53	. . . . .	. . . . .	. . . . .	. . . . .
		<i>l</i>	31.7 31.9 33.0	32.20	. . . . .	. . . . .	. . . . .	. . . . .
		1905 January 28.			Good.					
		4 22		<i>l</i>	20.0 21.2 20.7	20.63	20.33	1.74	11.83	11.91
<i>h</i>	22.0 21.9 22.3			22.07	21.04	1.83	11.92	12.00		
<i>z</i>	41.2 41.3 40.7			41.07	40.67	3.85	13.94	14.02		
<i>w</i>	36.1 37.0 36.4			36.50	36.05	3.31	13.40	13.48		
<i>y</i>	42.7 43.6 43.3			43.20	43.08	4.11	14.20	14.28		
<i>x</i>	31.9 32.1 31.7			31.90	31.34	2.79	12.88	12.96		
<i>u</i>	34.0 33.9 34.1			34.00	33.62	3.05	13.14	13.22		
<i>u</i>	33.1 33.8 32.8			33.23	. . . . .	. . . . .	. . . . .	. . . . .
<i>x</i>	30.0 31.0 31.3			30.77	. . . . .	. . . . .	. . . . .	. . . . .
<i>y</i>	42.5 43.3 43.1			42.97	. . . . .	. . . . .	. . . . .	. . . . .
<i>w</i>	36.3 35.0 35.5			35.60	. . . . .	. . . . .	. . . . .	. . . . .
<i>z</i>	39.8 40.0 41.0			40.27	. . . . .	. . . . .	. . . . .	. . . . .
<i>h</i>	19.8 20.3 19.9			20.00	. . . . .	. . . . .	. . . . .	. . . . .
4 38	57			<i>l</i>	19.8 20.9 20.0	20.23	

TABLE 8.—103 T ANDROMEDÆ—Continued.

1905 February 25.				Fair to good, low.				
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3	Mean of 6.		H.	P.
h m	°	<i>l</i>	22.2 22.1 22.3	22.20	21.68	1.89	11.89	11.97
		<i>k</i>	21.3 22.4 22.7	22.13	20.46	1.75	11.75	11.83
		<i>z</i>	41.5 42.3 42.9	42.23	42.82	4.08	14.08	14.16
		<i>w</i>	40.3 39.3 40.2	39.93	40.05	3.79	13.79	13.87
		<i>v</i> _{a1}	11.5 10.4 11.4	11.10	10.82	0.53	10.53	10.61
		<i>y</i>	48.2 48.1 48.9	48.40	47.76	4.60	14.60	14.68
		<i>x</i>	32.5 33.8 32.9	33.07	33.25	3.00	13.00	13.08
		<i>u</i>	35.2 35.1 34.7	35.00	34.68	3.16	13.16	13.24
		<i>t</i>	34.4 34.0 34.7	34.37	.....	.....	.....	.....
		<i>s</i>	32.8 34.2 33.3	33.43	.....	.....	.....	.....
		<i>r</i>	46.9 47.3 47.2	47.13	.....	.....	.....	.....
		<i>q</i> _{a1}	10.2 10.3 11.1	10.53	.....	.....	.....	.....
		<i>p</i>	40.6 39.8 40.1	40.17	.....	.....	.....	.....
		<i>o</i>	42.5 44.5 43.2	43.40	.....	.....	.....	.....
		<i>n</i>	18.2 21.3 19.9	19.80	.....	.....	.....	.....
		<i>m</i>	20.0 21.7 21.8	21.17	.....	.....	.....	.....
	35	<i>l</i>						

Table 8 gives the detailed photometric measures and reductions of the comparison stars in Table 7, based on the stars in Table 5. The series measured on three nights with the 6-inch includes the three catalogue stars *A*, *B*, and *a*, also the six comparison stars, *b*, *c*, *d*, *e*, *l*, and *s*. A complete series consists of three settings on each star in the list, followed immediately by three more settings on the stars in reverse order. Thus the mean of the times is the same for each star and any progressive changes in the real or the artificial star will be eliminated. In the seventh column there are two mean scale readings for each star, which are united into the single mean of the eighth column. The ninth column contains the values of *C* (curve reading) corresponding to each mean scale reading. These are taken from the absorption curves, *E* 6 for the 6-inch and *A* 12 for the 12- and 40-inch, and express the relative magnitudes of the stars as explained below. To convert *C* into magnitudes in the system of the catalogue, it is increased by the quantity *M*₀ taken from Table 9. For example, on October 15 the mean *C* for the three standard stars is 0.88; the mean of their magnitudes from the H. C. O. Catalogue is 7.69; the difference in the two quantities, called *M*₀, is 6.81. If *M*⁰ be added to each *C*, the mean of the sums for the three standard stars will agree with the mean of their catalogue magnitudes, and the separate sums will preserve the relative magnitudes as measured. The quantity *M*₀ is the magnitude of the zero reading on the absorption curve, and when increased by the *C* of each star will give the magnitude in the system used. In the example we are using the *M*₀ in the Potsdam system is 6.89. Adding these values of *M*₀ to *C* we have the last two columns of Table 8, the measured magnitudes in the H. C. O. and P. DM. systems.

The sidereal time and zenith distance, given in the first two columns of Table 8, serve to show that no correction is needed for change in atmospheric absorption due to difference in zenith distance between the standard stars and the stars to be measured. For example, on October 15, when the field was near the meridian,

the mean zenith distance of the three standard stars was $\frac{1}{2}^\circ$ less than that of the measured stars. At zenith distance 21° a difference of $\frac{1}{2}^\circ$ corresponds to a change of 0.001 magnitude in the atmospheric absorption, which is negligible. The stars measured with the 12- and 40-inch were all within $20'$ of the variable, so that the correction would be even less. The subscript a_1 , appended to the star letter, shows that the star was measured through one shade glass, which increases the magnitude numerically by 0.75 for the 6-inch and 0.84 for the 12- and 40-inch measures.

TABLE 9.—103 T ANDROMEDÆ. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

6-INCH.															
Star.	October 15.					October 27.					October 30.				
	C.	Obs. Mag.		Δ Mag.		C.	Obs. Mag.		Δ Mag.		C.	Obs. Mag.		Δ Mag.	
		H.	P.	H.	P.		H.	P.	H.	P.		H.	P.	H.	P.
A B a	0.84	7.65	7.73	-.02	-.03	0.44	7.63	7.71	-.04	-.05	0.43	7.55	7.63	-.12	-.13
	0.63	7.44	7.52	+.23	+.10	0.30	7.49	7.57	+.28	+.15	0.37	7.49	7.57	+.28	+.15
	1.16	7.97	8.05	-.23	-.07	0.76	7.95	8.03	-.25	-.09	0.90	8.02	8.10	-.18	-.02
Means.	0.88	7.69	7.77	$\pm .16$	$\pm .07$	0.50	7.69	7.77	$\pm .19$	$\pm .10$	0.57	7.69	7.77	$\pm .19$	$\pm .10$
M_0.....	.....	6.81	6.89	.....	.....	.....	7.19	7.27	.....	.....	.....	7.12	7.20	.....	.....

12-INCH.					40-INCH.				
Star.	Mag. 6-inch.	C.			Star.	Mag. 12-inch.	C.		
		Sept. 11.	Oct. 31.	Nov. 2.			Jan. 14.	Jan. 28.	Feb. 25.
b	8.81	0.88	0.19	1.27	k	11.85	2.96	1.83	1.75
c	9.33	1.43	1.12	2.15	l	11.66	3.00	1.74	1.89
d	9.22	1.07	0.76	1.74	x	13.12	4.13	2.79	3.00
Mean C...	.....	1.13	0.69	1.72	Mean C...	.....	3.36	2.12	2.21
Mean Mag.	9.12	9.12	9.12	9.12	Mean Mag.	12.21	12.21	12.21	12.21
M_0.....	.....	7.99	8.43	7.40	M_0.....	.....	8.85	10.09	10.00

Table 9 contains the values of C, the reading from the absorption-curve of the wedge. From the mean C we derive the M₀ used in the reductions. In the first part of the table (6-inch) the observed magnitudes of the three standard stars are given, both in the Harvard and Potsdam systems, in the columns headed H. and P. Subtracting the catalogue magnitudes in Table 5 from these observed values gives the residuals tabulated under " Δ Mag." for each system. The conclusions which may be drawn from these residuals are discussed in Chapter XIV. As the measures with the 12-inch are based on the standards fixed with the 6-inch, the second division of the table contains the 6-inch magnitudes of the three standard stars *b*, *c*, and *d*, from Table 10, and the values of C found on the three nights with the resulting values of M₀. Similarly the 40-inch division of the table gives the magnitudes derived with the 12-inch for *k*, *t*, and *x*, with C and M₀. In the last two divisions the magnitudes are given in the Harvard system only, to express them in the Potsdam system add 0.08 as shown in Table 5.

TABLE 10.—103 T ANDROMEDÆ. MEAN MAGNITUDES.
6-INCH.

Star.	October 15.		October 27.		October 30.		Mean.		
	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag. H.	Mag. P.	Δ Mag.
A	7.65	+0.04	7.63	+0.02	7.55	−0.06	7.61	7.69	±0.04
B	7.44	−0.03	7.49	+0.02	7.49	+0.02	7.47	7.55	±0.02
a	7.97	−0.01	7.95	−0.03	8.02	+0.04	7.98	8.06	±0.03
Mean							7.69	7.77	±0.03
b	8.88	+0.07	8.85	+0.04	8.71	−0.10	8.81	8.89	±0.07
c	9.22	−0.11	9.34	+0.01	9.42	−0.09	9.33	9.41	±0.07
d	9.04	−0.18	9.27	+0.05	9.36	+0.14	9.22	9.30	±0.12
e	10.43	+0.18	10.08	−0.17	10.25	0.00	10.25	10.33	±0.12
l	10.23	+0.01	10.24	+0.02	10.19	−0.03	10.22	10.30	±0.02
s	10.33	+0.01	10.11	−0.21	10.51	+0.19	10.32	10.40	±0.14
Mean							9.69	9.77	±0.09

12-INCH.

Star.	September 11.		October 31.		November 2.		Mean.		
	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag. H.	Mag. P.	Δ Mag.
b	8.87	+0.15	8.62	−0.10	8.67	−0.05	8.72	8.80	±0.10
c	9.42	−0.09	9.55	+0.04	9.55	+0.04	9.51	9.59	±0.06
d	9.06	−0.06	9.19	+0.07	9.14	+0.02	9.12	9.20	±0.05
Mean							9.12	9.20	±0.07
e	10.16	−0.04	10.22	+0.02	10.22	+0.02	10.20	10.28	±0.03
h	11.84	−0.01	11.72	−0.13	11.99	+0.14	11.85	11.93	±0.09
l	10.04	−0.11	10.33	+0.18	10.07	−0.08	10.15	10.23	±0.12
t	11.77	+0.11	11.47	−0.19	11.75	+0.09	11.66	11.74	±0.13
x	13.16	+0.04	13.21	+0.09	13.0±	−0.12	13.12	13.20	±0.08
Mean							11.40	11.48	±0.09

40-INCH.

Star.	January 14.		January 28.		February 25.		Mean.		
	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag. H.	Mag. P.	Δ Mag.
h	11.81	−0.02	11.92	+0.09	11.75	−0.08	11.83	11.91	±0.06
l	11.85	−0.01	11.83	−0.03	11.89	+0.03	11.86	11.94	±0.02
x	12.98	+0.03	12.88	−0.07	13.00	+0.05	12.95	13.03	±0.05
Mean							12.21	12.29	±0.04
s	13.35	+0.13	13.14	−0.08	13.16	−0.06	13.22	13.30	±0.09
z	13.84	+0.16	13.40	−0.28	13.79	+0.11	13.68	13.76	±0.18
y			14.20	−0.20	14.60	+0.20	14.40	14.48	±0.20
z	14.22	+0.14	13.94	+0.14	14.08	0.00	14.08	14.16	±0.09
Mean							13.85	13.93	±0.14

Table 10 collects the magnitude results for each night from Table 8 and forms the means. The magnitudes for the separate nights are expressed in the Harvard system, and followed by the column " Δ Mag." giving the residuals from the mean of three nights. The columns of means give the magnitude in both systems, and lastly the means of the separate residuals.

Table 11 gives the comparisons of the variable by Argelander's method (including a few photometric and photographic), the resulting photometric magnitudes of the variable, and a comparison with the mean light-curve. The Central Time (6 hours west of Greenwich) is given in the third column to the nearest hour, but as the records were usually made to the nearest quarter hour, the decimal of the Julian day in the fourth column is carried farther and sometimes differs by one or two hundredths from the hour in column three. In the fifth column, "Aperture," 6 stands for the $6\frac{1}{2}$ -inch Brashear reflector (clear aperture equivalent to 6.2 inches = 15 cm.), 3 for the same with diaphragm, 12 and 40 for the Yerkes refractors (30 and 102 cm. respectively), 24 for the 60 cm. reflector.

The comparisons in the seventh column, unless otherwise stated, were made by Argelander's method, the comparison stars being denoted by letters, v standing for the variable. The stars compared were brought equally distant from the center of the field and the head turned till the line joining the eyes was parallel to that joining the stars. Then by glancing from one star to the other the interval in steps was estimated. In the records the brighter star is given first; $c1v$ is read " c is one step brighter than the variable;" $b4-5v$, b is four or five steps brighter than the variable. When the variable was not seen the limiting magnitude is usually estimated from the faintest comparison star visible, for example "limit $4 < e$ " means that the limit of visibility is four steps fainter than e .

The reductions in columns 8, 9, and 10 were made as follows: (1) The light scale was formed in the usual manner from all the step intervals in column 7, with the results given in the fifth column of Table 7. (2) Each comparison in the seventh column then gives the brightness of the variable in steps, column 8. For example, on the first date, since $b = 39.0$ steps, the comparison $b4-5v$ gives 34.5 for the brightness of the variable. (3) To form the mean step values for the ninth column, if the estimated interval is greater than two or three steps the results are weighted inversely as the interval. (4) To obtain the corresponding photometric magnitudes given in the tenth column in the Harvard system, recourse is had to the "Magnitude-Curve" (fig. 4). Using the data in Table 7, for the stars measured with the photometer, the step values are platted as ordinates and the magnitudes as abscissæ. (5) A smooth curve is drawn through the platted points, giving from the step values in the ninth column the magnitudes in the tenth. The step values of the stars not measured are entered in crosses on the magnitude-curve, and the resulting magnitudes are given in Table 7, eighth and ninth columns.

TABLE 11.—103 T ANDROMEDÆ. VISUAL OBSERVATIONS OF THE VARIABLE.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing	t	Δ Mag
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
1	1894		2410000+									
2	Mar. 15	7	2903.54	6	6	b4-5v, c1v, v1-2d.	34.5, 32.6, 36.2.	34.4	9.27	moon	0	+0.45
3	17	7	2905.54	6	6	c1-2v, difficult. ....	.....	32.1	9.60	fair	2	+0.74
4	21	7	2909.54	6	6	{ v glimpsed, b2-3 v?.. } { d glimpsed. .... }	.....	36.5	8.97	low	6	+0.04
5	23	7	2911.54	6	6	v not seen, trees, etc. ....	.....	.....	.....	.....	8	.....
6	26	17	2914.96	6	6	twilight too bright. ....	.....	.....	.....	.....	11	.....
7	Apr. 1	16	2920.94	6	6	c and d seen, v uncertain. ....	.....	34	9.3	.....	17	.....
8	3	16	2922.92	40	6	d1-2v, quite certain. ....	.....	33.2	9.47	good	19	+0.17
9	11	16	2930.92	40	6	d2-3v, uncertain. ....	.....	32.2	9.59	fair	27	-0.01
10	15	16	2934.92	150	6	d2v, c2-3v.	32.7, 31.6.	31.8	9.64	low	31	-0.13
11	24	16	2943.92	6	6	d3-4v.	31.2.	31.2	9.74	fair	40	-0.37
12	27	16	2946.92	6	6	d3v, c4v, v1-2e.	31.7, 29.6, 32.2.	31.4	9.70	fair	43	-0.52
13	May 2	16	2951.92	6	6	d3v, v0-1e.	31.7, 31.2.	29.2	10.02	low	48	-0.40
14	7	15	2956.88	6	6	e1v, (e1-2v). ....	.....	29.2	10.02	fair	53	-0.60
15	24	15	2973.88	6	6	d5-6v, c4-5v, e1-2v.	29.2, 29.1, 29.2.	22.8	10.99	fair	70	-0.30
16	June 30	11	3010.71	6	6	e6v, v3h.	24.7, 21.9.	< 14	12.3	fair	107	.....
17	July 29	10	3039.67	6	6	v not held, h and k seen. ....	.....	< 27	10.3	fair	.....	.....
18	Nov. 15	6	3148.50	40	6	v not held, limit 4 < e. ....	.....	35.1	9.18	fair	245	+0.38
19	20	7	3153.54	40	6	b3v, d0-1v, v1-2c.	36.0, 34.2, 35.1.	37.8	8.78	good	250	+0.18
20	23	7	3156.54	150	6	v4c, v0, v2d, a4v.	37.6, 39.0, 36.7, 38.0.	39.2	8.58	fine	253	+0.03
21	26	7	3159.54	40	6	a2v, v3d, v1b, h2k.	40.0, 37.7, 40.0.	39.4	8.54	good	256	+0.02
22	Dec. 2	6	3165.50	40	6	limit 2-3 < k? ....	.....	39.7	8.50	good	262	-0.04
23	5	8	3168.58	40	6	a2-3v, v4d, v1b.	39.5, 38.7, 40.0.	39.0	8.60	good	265	+0.03
24	13	6	3176.50	40	6	a3v, v5d, v2b.	39.0, 39.7, 41.0.	39.4	8.52	good	273	-0.17
25	17	6	3180.50	40	6	v1b, a2-3v, v4d.	40.0, 39.5, 38.7.	38.4	8.67	fine	277	-0.07
26	20	7	3183.54	40	6	a2-3v, v3-4d, v1b.	39.5, 38.2, 40.0.	38.5	8.66	fair	280	-0.13
27	29	7	3192.54	40	6	a2v, v2d, v1b.	40.0, 36.7, 40.0.	37.8	8.78	good	3	-0.10
28	Jan. 1	7	3195.54	40	6	a3v, v4d, v1-2b.	39.0, 38.7, 40.5.	38.9	8.62	good	7	-0.38
29	3	7	3197.54	40	6	a3v, v4d, v1-2b.	39.0, 38.7, 40.5.	37.6	8.80	good	10	-0.23
30	7	7	3201.54	40	6	a3v, v4d, v1-2b.	39.0, 38.7, 40.5.	36.4	8.98	good	12	-0.12
31	15	7	3209.54	40	6	a3v, v4d, v1-2b.	39.0, 38.7, 40.5.	36.5	8.97	.....	16	-0.25
32	22	6	3216.50	40	6	a3v, v4d, v1-2b.	39.0, 38.7, 40.5.	35.4	9.12	.....	24	-0.36
33	26	7	3220.54	40	6	a3v, v4d, v1-2b.	39.0, 38.7, 40.5.	33.3	9.43	good	31	-0.34
34	31	7	3225.54	40	6	a3v, v4d, v1-2b.	39.0, 38.7, 40.5.	32.5	9.55	good	35	-0.36
35	Feb. 15	7	3240.54	40	6	a3v, v4d, v1-2b.	39.0, 38.7, 40.5.	31.3	9.72	poor	40	-0.38
36	21	7	3246.54	40	6	a3v, v4d, v1-2b.	39.0, 38.7, 40.5.	28.4	10.15	good	55	-0.54
37	Mar. 1	7	3254.54	40	6	a3v, v4d, v1-2b.	39.0, 38.7, 40.5.	24.6	10.71	good	61	-0.21
38	11	7	3264.54	40	6	a3v, v4d, v1-2b.	39.0, 38.7, 40.5.	22.2	11.07	good	69	-0.14
39	16	7	3269.54	40	6	a3v, v4d, v1-2b.	39.0, 38.7, 40.5.	< 26	< 10.0	poor	79	.....
40	7	7	3270.54	40	6	a3v, v4d, v1-2b.	39.0, 38.7, 40.5.	< 25	< 10.6	good	84	.....
41	May 26	14	3310.83	150	6	a3v, v4d, v1-2b.	39.0, 38.7, 40.5.	< 26	< 10.5	fair	85	.....
42	July 24		3399.63	40	6	a3v, v4d, v1-2b.	39.0, 38.7, 40.5.	< 16	< 12.0	fair	125	.....
						v not seen, limit 2-3 < h. ....	.....	27.7	10.24	fair	214	-0.37
						v8h.	26.9.					
						e3v, v2l.	27.7, 28.5.					

TABLE 11.—103 T ANDROMEDÆ. VISUAL OBSERVATIONS OF THE VARIABLE—Continued.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
43	1895 Aug. 5	9	2410000+	...	6	d2v, c3v.....	32.7, 30.6	31.6	9.68	moon	226	-0.22
44	8	8	3414.61	40	6	v4-5l, c1v, v5e, v2f, d1-2v	31.0, 32.6, 35.7 31.5, 33.2	32.8	9.51	fair	229	-0.26
45	12	9	3418.63	40	6	v6l, v3c, v1d, b4v	32.5, 36.6, 35.7 35.0	35.0	9.20	good	233	-0.29
46	25	8	3431.58	40	6	a4, v2, vb, v5d	38.0, 39.0, 39.7 39.0, 38.0, 38.7	38.8	8.63	good	246	-0.10
47	26	8	3432.58	40	3	a3v, b1v, v4d	37.5, 37.0, 37.7	37.4	8.82	good	247	+0.12
48	30	8	3436.58	40	3	a4-5v, b2v, v3d	39.0, 39.7, 40.5 38.0, 38.0, 39.2	39.0	8.60	good	251	+0.01
49	Sept. 2	9	3439.63	40	3	a3v, v5d, v1-2b	39.0, 39.5, 39.7	39.4	8.55	fair	254	+0.01
50	9	8	3446.58	40	3	a3v, b1v, v4-5d	39.0, 37.0, 38.7	38.2	8.72	poor	261	+0.19
51	16	8	3453.58	40	6	a2-3v, v3-4d, v0-1b	39.5, 38.2, 39.5 39.0, 37.7, 38.0	39.1	8.59	fair	268	-0.01
52	17	7	3454.54	40	3	a3v, v3d, b1v	40.0, 38.7, 39.0 38.5, 38.7	38.7	8.63	good	269	+0.02
53	26	7	3463.54	40	3	a2v, v4d, vb	39.0, 37.7, 38.0 40.0, 40.7, 40.5	38.4	8.70	fair	278	-0.07
54	Oct. 5	7	3472.54	40	6	a3v, v3d, b1v	38.0, 37.7	40.4	8.38	fair	5	-0.53
55	9	8	3476.58	40	6	a2v, v6d, v1-2b	38.0, 37.7	37.8	8.78	good	9	-0.22
56	15	8	3482.58	40	6	b1v, v3d	35.0, 35.2, 37.6	35.6	9.10	good	15	-0.09
57	19	7	3486.54	40	6	b4v, v0-1d, v4c	33.0, 34.7, 35.6	34.4	9.27	good	19	-0.03
58	23	7	3490.54	40	6	b6v, vd, v2c	36.0, 34.7, 34.6	35.1	9.18	good	23	-0.29
59	Nov. 1	7	3499.54	40	6	b3v, vd, v1c	32.7, 32.6, 33.5 31.6, 32.7, 32.5	32.9	9.50	fair	32	-0.29
60	10	7	3508.54	40	6	d2v, c1v, v4f	30.9	31.9	9.63	good	41	-0.50
61	15	7	3513.54	40	6	c2v, v2e, v3f, v4-5l	30.6, 32.2, 28.5	30.4	9.85	good	46	-0.48
62	Dec. 2	6	3530.50	40	6	c3v, v1-2e, v2l	24.5, 25.0	24.8	10.68	moon	63	-0.30
63	9	7	3537.54	40	6	l2v, v4-5m	21.5, 22.5, 22.9	22.3	11.05	good	70	-0.22
64	25	7	3553.54	150	6	l5v, v2m, v4h	17.5, 20.5, 20.2	19.8	11.42	fair	86	-0.47
65	1896 Jan. 6	7	3565.54	150	6	l8-10v, vm, v2h	15.9, 15.8	15.8	12.00	fair	98	-0.36
66	13	7	3572.54	150	6	h3v, v1-2k	14.9, 15.3	15.1	12.11	good	105	-0.40
67	20	7	3579.54	150	6	h4v, v1k, limit 3 < k		14.3	12.22	moon	112	-0.45
68	Feb. 5	7	3595.54	150	6	vk		11.8	12.60	fair	128	-0.20
69	8	7	3598.54	150	6	k2-3v, limit v		11.8	12.60	good	131	-0.21
70	21	7	3611.54	150	6	k2-3v, limit v		< 16	< 12.0	moon	144	....
71	Mar. 1	7	3620.54	150	6	v not seen, limit 3 < h		< 12	< 12.6	good	153	....
72	3	7	3622.56	40	6	v not seen, limit 2 < k		< 16	< 12.0	good	155	....
73	12	7	3631.54	...	6	v not seen, limit 1-2 < h		< 19	< 11.5	good	164	....
74	Aug. 3	10	3775.67	40	6	v not seen, limit h		31.4	9.70	poor	164	....
75	27	9	3799.63	150	6	v4-5l, d3v	31.0, 31.7	23.4	10.88	good	26	+0.15
76	Sept. 7	8	3810.58	150	6	l3v, v4-5h	23.5, 23.4	22.4	11.03	good	50	+0.40
77	25	7	3828.54	150	6	l5v, v4-5h	21.5, 23.4	15.6	12.04	good	61	+0.13
78	Oct. 6	7	3839.54	150	6	h3v, v1k	15.9, 15.3	16.6	11.88	good	79	+0.62
79	24	6	3857.52	80	6	h2v, v2k	16.9, 16.3	13.3	12.37	good	90	-0.19
80	Nov. 26	8	3890.58	150	6	k1v, limit 1-2 < v		9.2	12.97	good	108	-0.32
81	Dec. 23	6	3917.50	150	6	k5v, x1v	9.3, 9.0	11.9	12.59	fine	141	+0.17
82	1897 Jan. 6	6	3931.50	150	6	k2v, v1-2x	12.3, 11.5	15.0	12.12	good	168	+0.13
83	19	7	3944.54	150	6			18.6	11.59	good	182	+0.02
84	28	7	3953.54	150	6	h5-6v, v1-2k	13.4, 15.8	20.1	11.37	good	195	+0.06
85	Feb. 13	7	3969.54	150	6	h0-1v, v4-5k	18.4, 18.8	25.4	10.56	good	204	+0.25
86	May 24	15	4069.88	150	6	vh, l4v	18.9, 22.5	23.2	10.91	good	220	+0.31
87	July 21	10	4127.67	150	6	v0-1h, l6-8v	19.4, 19.5	12.3	12.51	good	39	+0.84
88	Aug. 19	9	4156.63	150	6	l1v, v8k	25.5, 26.9	10.4	12.80	fair	97	+0.21
89	27	10	4133.67	150	6	l2v	24.5	10.3	12.81	good	103	+0.32
90	27	9	4164.63	150	6	l5v, v6h	21.5, 24.9	10.3	12.80	fair	126	+0.01
				150	6	k2v, limit v		10.4	12.80	good	134	-0.01
				150	6	k4v, v0-1x	10.3, 10.5					
				150	6	k4v, limit v						
				150	6	k4v, v0-1x	10.3, 10.5					

TABLE 11.—103 T ANDROMEDÆ. VISUAL OBSERVATIONS OF THE VARIABLE—Continued.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
1897												
91	Sept. 16	7	2410000+	150	6	k ₄ -5v, x not seen.....		9.8	12.90	fair	153	+0.22
92	20	8	4184.54	150	6	k ₂ v, v ₄ x, limit x.....	12.3, 14.0.....	13.2	12.38	good	157	-0.27
93	24	8	4192.58	150	6	k ₁ v, v ₅ x, h ₄ v.....	13.3, 15.0, 14.9.....	14.4	12.20	good	161	-0.38
94	29	8	4197.58	150	6	v ₂ k, h ₃ v.....	16.3, 15.9.....	16.1	11.97	good	166	-0.52
95	Oct. 14	7	4212.54	150	6	v ₂ k, h ₁ -2v.....	16.3, 17.4.....	16.8	11.85	good	181	-0.29
96	23	7	4221.54	40	6	h ₂ v, v ₂ k.....	16.9, 16.3.....	17.0	11.80	good	190	+0.03
				150	6	h ₁ -2v, v ₃ h.....	17.4, 17.3.....					
				150	6	h ₀ -1v, v ₅ k.....						
97	25	6	4223.50	80	6	h ₂ n, n ₁₀ , o ₁ p, p ₁ q, q _k	18.4, 19.3.....	18.8	11.56	good	191	-0.14
				80	6	k ₄ r, k ₂ t, l _s						
				40	6	h ₁ v, v ₆ k.....	17.9, 20.3.....					
98	29	7	4227.54	150	6	l ₆ v, v ₁ h.....	20.5, 19.9.....	19.6	11.45	good	196	-0.04
99	Nov. 11	7	4240.54	40	6	v ₄ h, l ₂ v.....	22.9, 24.5.....	23.7	10.84	good	209	-0.04
100	17	7	4246.54	40	6	v ₁ l, d ₆ v.....	26.5, 29.7.....	27.6	10.27	good	215	-0.27
101	20	7	4249.54	40	6	v ₁ -2l, d ₆ v.....	28.0, 28.7.....	28.3	10.17	good	218	-0.20
102	Dec. 29	7	4288.54	40	6	v ₂ b, a ₀ -1v.....	41.0, 41.5.....	41.2	8.28	good	257	-0.24
1898												
103	Jan. 16	7	4306.54	40	6	a ₃ v, v ₀ -1b, a ₄ b.....	39.0, 39.5.....	39.2	8.57	good	275	-0.13
104	23	6	4313.50	40	6	b ₀ -1v, v ₂ d, v ₈ l.....	38.5, 36.7, 34.5.....	37.0	8.90	good	0	+0.08
105	Feb. 5	7	4326.54	40	6	d ₂ v, v ₅ l.....	32.7, 31.5.....	32.1	9.60	fair	13	+0.48
106	24	7	4345.54	150	6	d ₄ v, v ₃ l.....	30.7, 29.5.....	30.1	9.89	fair	32	+0.11
107	Mar. 4	7	4353.54	40	6	l ₁ -2v.....		25.0	10.63	fair	40	+0.53
108	13	7	4362.54	150	6	l ₄ v.....		22.5	11.02	fair	49	+0.60
109	Aug. 29	8	4531.58	40	6	l ₁ v, v ₁ s, uncertain.....	25.5, 26.1.....	25.8	10.52	moon	218	+0.15
110	Sept. 8	8	4541.58	40	6	v ₁ l, c ₅ v.....	26.5, 28.6.....	27.2	10.31	fair	228	+0.51
111	Oct. 11	7	4574.54	80	6	a ₃ -4v, v ₄ d, v ₂ b.....	38.5, 38.7, 41.0.....	39.4	8.54	good	261	+0.01
112	Nov. 5	6	4599.50	40	6	b ₁ -2v, v ₃ -4d.....	37.5, 38.2.....	37.8	8.78	good	4	-0.11
113	19	7	4613.54	40	6	b ₄ -5v, v ₃ l, d ₀ -1v, v ₁ c.....	34.5, 29.5, 34.2, 34.6.....	33.2	9.47	good	18	+0.19
114	Dec. 3	7	4627.54	40	6	d ₅ v, l ₁ v.....	29.7, 25.5.....	27.6	10.27	good	32	+0.47
115	22	6	4646.50	150	6	l ₄ -5v, v ₅ h.....	22.0, 23.9.....	23.0	10.94	good	51	+0.42
1899												
116	Jan. 2	6	4657.50	150	6	l ₃ v, v ₁ h.....	23.5, 19.9.....	21.1	11.20	poor	62	+0.25
117	9	6	4664.5	150	6	l ₆ -8v, v ₃ k, v ₂ h.....	19.5, 17.3, 20.9.....	19.2	11.50	fair	69	+0.30
118	24	6	4679.5	150	6	h ₂ -3v, h ₂ v.....	16.4, 12.3.....	14.4	12.20	moon	84	+0.43
119	Feb. 15	6	4701.5	150	6	h ₄ v, limit v.....		10.3	12.81	moon	106	+0.28
120	28	8	4714.58	150	6	h ₄ -5v, limit v.....		9.8	12.89	low	119	+0.16
121	Mar. 7	7	4721.54	150	6	v not seen, limit 1-2 < h.....		< 17	< 11.8	....	126	....
122	Aug. 10	9	4877.63	40	6	a ₄ v, v ₆ , v ₃ d.....	38.0, 39.0, 37.7.....	38.2	8.72	fair	0	-0.01
123	18	8	4885.58	40	6	b ₂ -3v, v ₂ d.....	36.5, 36.7.....	36.6	8.98	moon	8	-0.02
124	Sept. 1	8	4899.58	40	6	b ₄ v, d ₁ v, v ₁ c.....	35.0, 33.7, 34.6.....	34.4	9.27	fair	22	-0.13
125	13	7	4911.56	40	6	d ₄ v, v ₀ -1c, v ₄ l.....	30.7, 34.1, 30.5.....	31.8	9.64	good	34	-0.23
126	Oct. 2	8	4930.58	40	6	c ₅ -6v, v ₁ l, v ₅ h.....	28.1, 26.5, 23.9.....	26.2	10.47	good	53	-0.15
127	7	7	4935.54	40	6	l ₂ v, v ₄ -5h.....	24.5, 23.4.....	24.0	10.63	good	58	-0.18
128	23	7	4951.54	150	6	l ₆ v, v ₂ h, v ₄ k.....	20.5, 20.9, 18.3.....	19.9	11.40	good	74	0.00
129	30	7	4958.56	150	6	h ₂ -3v, v ₂ -3k.....	16.4, 16.8.....	16.6	11.88	good	81	+0.19
130	Nov. 4	7	4963.56	150	6	h ₂ v, v _k , x not held.....	16.9, 14.3.....	15.6	12.03	fair	86	+0.13
131	20	7	4979.54	150	6	h ₁ v, v ₂ x.....	13.3, 12.0.....	12.6	12.48	poor	102	+0.03
132	27	7	4986.54	200	6	h ₃ v, v ₁ x.....	11.3, 11.0.....	11.2	12.69	good	109	+0.09
133	Dec. 6	7	4995.54	150	6	h ₃ v, v ₁ x.....	11.3, 11.0.....	11.2	12.69	good	118	-0.04
134	19	7	5008.54	200	6	h ₃ v, limit v.....		11.3	12.67	fair	131	-0.14
135	23	7	5012.54	200	6	h ₄ v, v _x , limit v or x.....	10.3, 10.0.....	10.2	12.82	fair	135	+0.01
136	29	7	5018.52	200	6	x ₀ -1v, limit v.....		10.±	12.86	....	141	+0.06
1900												
137	Jan. 1	6	5021.50	200	6	h ₅ v, v ₀ -1x.....	9.3, 10.3.....	9.8	12.89	good	144	+0.09
138	22	7	5042.54	150	6	v not seen, limit h.....		< 10	< 12.9	poor	165	....
139	24	7	5044.54	150	6	h ₃ v, v ₂ -3x, limit x.....	11.3, 12.5.....	11.9	12.59	good	167	+0.11

TABLE 11.—103 T ANDROMEDÆ. VISUAL OBSERVATIONS OF THE VARIABLE—Continued.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
140	1900 Feb. 15	7	2410000+	150	6	<i>h2v, v2k</i>	16.9, 16.3	16.6	11.89	fair	189	+0.06
141	26	7	5066.54	150	6	<i>vh±</i> .....	.....	19.±	11.5	poor	200	+0.2
142	May 20	14	5160.83	40	6	<i>b1v, v2-3d</i>	38.0, 37.2	37.6	8.80	fair	2	-0.07
143	June 25	14	5196.83	40	6	<i>c1-2v, v1l</i>	32.1, 27.5	29.8	9.94	good	38	+0.08
144	July 30	10	5231.67	40	6	<i>l5v, v4h</i>	21.5, 22.9	22.2	11.07	good	72	-0.30
145	Aug. 26	8	5258.58	150	6	<i>h2v, limit v</i> .....	.....	12.3	12.52	fair	99	+0.15
146	Sept. 15	7	5278.54	150	6	<i>v glimpsed, h5v</i> .....	.....	9.±	13.0	good	119	+0.27
147	Oct. 10	7	5303.54	150	6	<i>v not seen, limit l < k</i> .....	.....	<13	<12.4	moon	144	....
148	18	11	5311.71	237	40	<i>k4v, v2x</i>	10.3, 12.0	11.2	12.67	fair	152	-0.03
149	Nov. 21	7	5345.54	150	6	<i>h2v, v2k, l6-8v</i>	16.9, 16.3, 19.5 ..	17.2	11.79	good	186	-0.14
150	Dec. 11	7	5365.54	40	6	<i>l3v, v8-10k</i>	23.5, 23.3	23.4	10.88	good	206	-0.13
151	29	6	5383.50	40	6	<i>vl</i> .....	.....	26.5	10.42	good	224	+0.39
152	1901 Feb. 9	9	5425.63	40	6	<i>bv, v4-5d, v6e</i>	39.0, 39.2, 39.6 ..	39.3	8.57	fair	266	-0.02
153	1903 Feb. 16	..	6162.	..	24	photograph .....	.....	..	13.2±	....	157	....
154	24	8	6170.58	67	12	<i>x2v, limit v</i> .....	.....	8.0	13.17	good	165	+0.67
155	Oct. 11	8	6399.58	150	6	<i>k4v, limit v</i> .....	.....	10.3	12.81	good	112	+0.04
156	13	..	6401.	..	..	.....	.....	.....	.....	....	...	....
157	1904 Aug. 29	8	6722.58	150	6	<i>v not seen, limit 6 < h</i> ..	.....	<13	<12.4	poor	153	....
158	Sept. 11	10	6735.67	67	12	<i>v not seen, limit 3 < x</i> ..	.....	<7.0	<13.3	good	166	....
159	Oct. 6	..	6760.	..	6	<i>v not seen, limit x</i> .....	.....	<10	<12.9	good	191	....
160	27	8	6781.58	40	6	<i>ko-1v, v3x</i>	13.8, 13.0	13.4	12.36	fine	212	+1.65
161	30	6	6784.50	40	6	<i>vk, v3x</i>	14.3, 13.0	13.6	12.34	good	215	+1.78
162	30	6	6784.50	460	40	<i>kv, v3x</i>	14.3, 13.0	13.6	12.34	good	215	+1.78
163	31	7	6785.54	67	12	photometer .....	.....	..	11.89	good	216	+1.40
164	Nov. 1	6	6786.50	67	12	photometer .....	.....	..	12.02	good	216	+1.53
165	2	7	6787.54	67	12	photometer .....	.....	..	11.84	fair	217	+1.38
166	14	..	6799.	..	12	photographs .....	.....	..	11.3±	....	230	....
167	29	6	6814.50	40	6	photometer .....	.....	..	10.45	fair	245	+1.87
168	1905 Jan. 14	9	6860.63	237	40	photometer .....	.....	..	8.42	fair	9	-0.58
169	28	8	6874.58	237	40	photometer .....	.....	..	8.58	good	23	-0.85
170	Feb. 25	7	6902.54	237	40	photometer .....	.....	..	9.69	good	51	-0.82
171	Mar. 3	7	6908.54	67	12	<i>e5v, v3-4l</i>	25.7, 30.0	27.9	10.11	fair	57	-0.59
172	May 22	15	6988.88	250	40	<i>h8v, v2x</i>	6.3, 12.0	10.9	12.70	moon	137	-0.08
173	June 10	15	7007.88	237	40	<i>x1v, v1u, v2w</i>	9.0, (13.15, 13.38).	..	13.18	fair	156	+0.51
174	27	15	7024.88	237	40	<i>vx</i>	10.0	10.0	12.86	fair	173	+0.52
175	July 30	12	7057.75	237	40	<i>v2k</i> .....	.....	16.3	11.87	good	206	+0.86
176	Aug. 9	14	7067.83	150	6	<i>l8-10v, v6k, v4h</i>	(15.5), 20.3, 22.9	21.6	11.14	good	216	+0.65
177	28	9	7086.63	150	6	<i>v8k, v7l, v3m, l5v</i>	22.3, 19.3, 23.5, 21.5	22.2	11.04	fair	235	+1.64
178	Sept. 17	8	7106.58	150	6	<i>e1-2v, d1v</i>	29.2, 33.7	31.4	9.68	poor	255	+1.15
179	Oct. 20	8	7139.58	80	12	<i>va</i> .....	.....	42.0	8.12	good	6	-0.78
180	Nov. 21	6	7171.50	150	6	<i>a6v, bv, v4d</i>	36.0, 39.0, 38.7 ..	38.2	8.70	good	38	-1.30

The whole time covered by the observations, starting from the first, was divided into parts corresponding in length with the star's assumed period. The quantity t in the twelfth column is the time elapsed in days since the beginning of each of these parts. The last column, " Δ Mag," gives the residual between the observed magnitude and the reading from the mean light-curve corresponding to the time t .

Table 12 gives the data for finding the mean light-curve, following the form used by Turner in his reductions of the Rousdon variable star observations¹ with some additions. Dividing the assumed period, 282 days, into twelve parts we have in this case 23.5 day groups. The heading of Table 12 gives in two lines the number of the group and the day number corresponding to the last

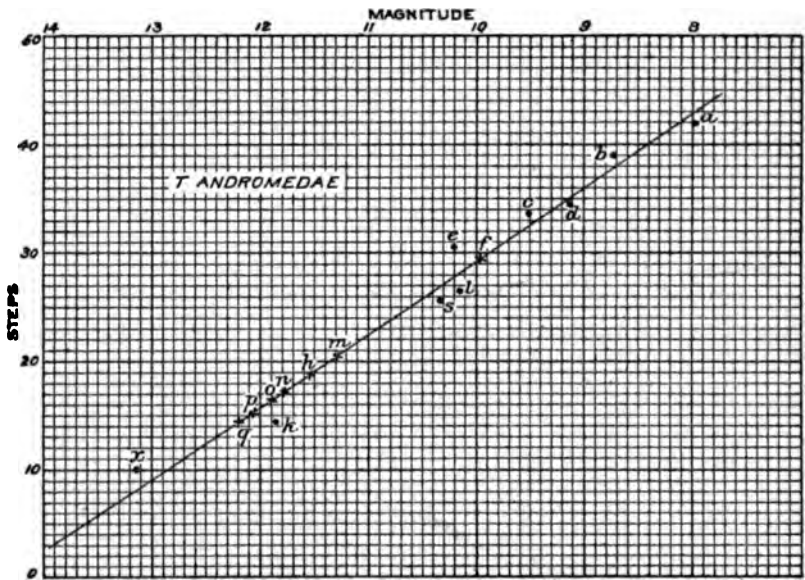


FIG. 4.—MAGNITUDE-CURVE FOR T ANDROMEDÆ.

day of the group. The first column gives the Julian day of the beginning of each period, starting from an arbitrary date, the first observation. Then follow for each group of each period, the mean t and magnitude in the Harvard system (found by averaging the quantities in the last two columns of Table 11 for the interval covered by the group) ΔM , the difference between the mean magnitude and the reading from the mean light-curve for the time t , and the number of nights' observations in the group. Finally, at the foot of the table will be found the general means of the tabulated quantities t , M and ΔM , followed by the total number of observations in each group. These general means of t and M are platted to form the mean light-curve (fig. 6, page 27).

¹ *Memoirs of the Royal Astronomical Society*, vol. 55, lix *et seq.*

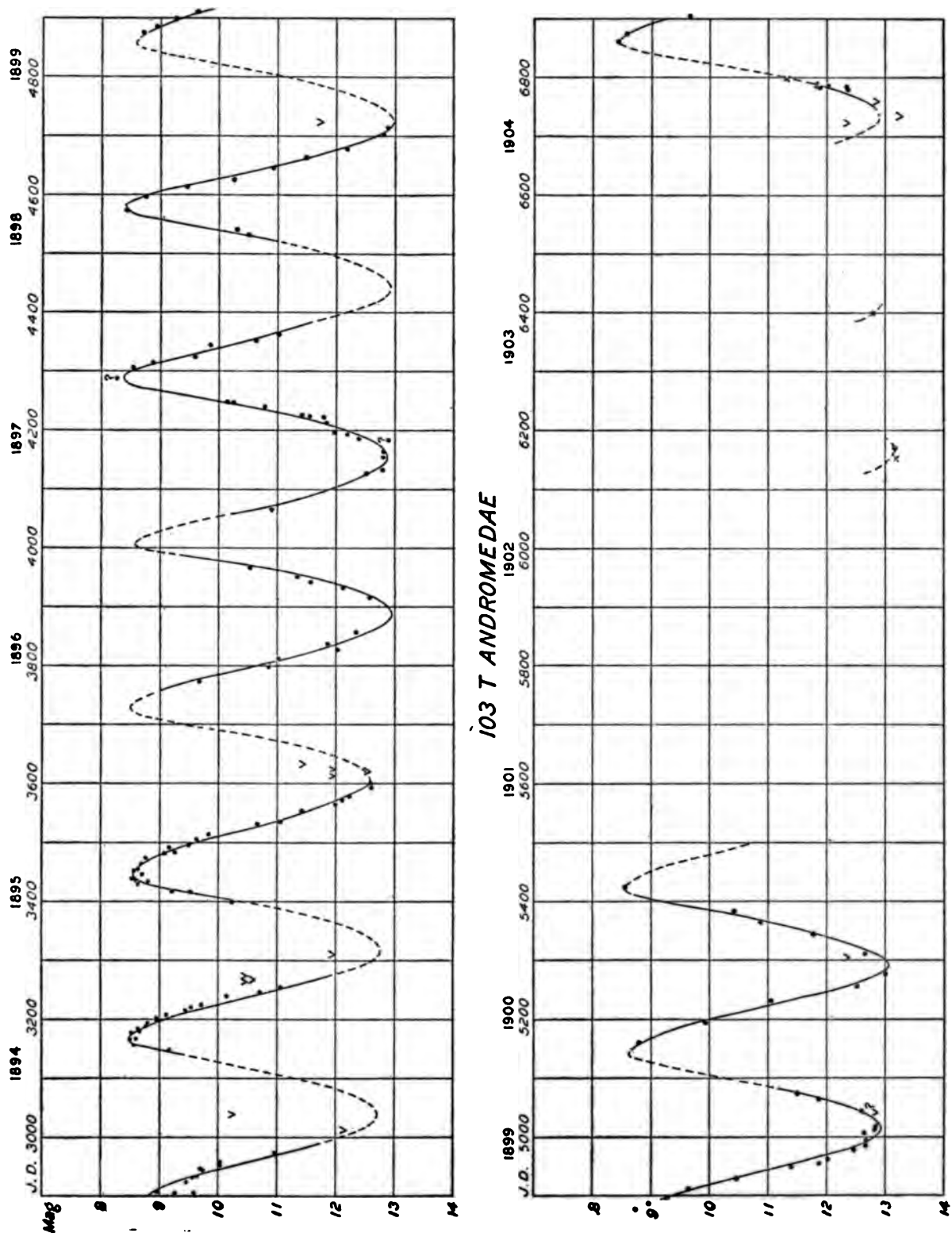


FIG. 5.—LIGHT-CURVE OF T ANDROMEDÆ.

TABLE 12.—MEAN MAGNITUDES FROM 23.5 DAY GROUPS.

Group No....	1	2	3	4	5	6	7	8	9	10	11	12
J. D.....	23.5	47	70.5	94	117.5	141	164.5	188	211.5	235	258.5	282
2903	<i>t</i>	9	35	50	70	....	....	....	....	....	251	274
	<i>M</i>	9.33	9.67	10.02	10.99	....	....	....	....	....	8.77	8.61
	<i>ΔM</i>	+0.35	-0.26	-0.50	-0.30	....	....	....	....	....	+0.15	-0.08
	No.	4	4	2	1	....	....	....	....	....	4	4
3185	<i>t</i>	14	33	62	....	....	....	....	....	223	250	269
	<i>M</i>	8.88	9.46	10.64	....	....	....	....	....	9.66	8.65	8.66
	<i>ΔM</i>	-0.18	-0.36	-0.30	....	....	....	....	....	-0.28	+0.01	+0.03
	No.	4	4	3	....	....	....	....	....	4	4	4
3467	<i>t</i>	12	36	66	86	105	130	....	....	....	....	....
	<i>M</i>	8.88	9.54	10.86	11.42	12.11	12.60	....	....	....	....	....
	<i>ΔM</i>	-0.22	-0.39	-0.26	-0.47	-0.40	-0.20	....	....	....	....	....
	No.	4	4	2	1	3	2	....	....	....	....	....
3749	<i>t</i>	....	26	56	84	108	141	....	175	200	220	....
	<i>M</i>	....	9.70	10.96	11.96	12.27	12.97	....	12.36	11.48	10.56	....
	<i>ΔM</i>	....	+0.15	+0.26	+0.22	-0.22	+0.17	....	+0.08	+0.16	+0.31	....
	No.	....	1	2	2	1	1	....	1	2	1	....
4031	<i>t</i>	....	39	....	....	100	130	157	174	196	216	257
	<i>M</i>	....	10.91	....	....	12.86	12.30	12.52	11.91	11.41	10.22	8.28
	<i>ΔM</i>	....	+0.84	....	....	+0.26	0.00	-0.12	-0.42	-0.05	-0.24	-0.24
	No.	....	1	....	....	2	2	3	2	4	2	1
4313	<i>t</i>	6	36	49	....	....	....	....	....	2.23	....	261
	<i>M</i>	9.25	10.26	11.02	....	....	....	....	....	10.42	....	8.54
	<i>ΔM</i>	+0.28	+0.32	+0.60	....	....	....	....	....	+0.33	....	+0.01
	No.	2	2	1	....	....	....	....	....	2	....	1
4595	<i>t</i>	11	32	61	84	106	119	....	....	....	....	....
	<i>M</i>	9.12	10.27	11.21	12.28	12.81	12.89	....	....	....	....	....
	<i>ΔM</i>	+0.04	+0.47	+0.32	+0.43	+0.28	+0.16	....	....	....	....	....
	No.	2	1	3	1	1	1	....	....	....	....	....
4877	<i>t</i>	10	1	56	80	106	128	142	167	194	....	....
	<i>M</i>	8.98	9.64	10.55	11.77	12.58	12.72	12.88	12.59	11.70	....	....
	<i>ΔM</i>	-0.05	-0.23	-0.16	+0.11	+0.06	-0.06	+0.08	+0.16	+0.13	....	....
	No.	3	1	2	3	2	3	2	1	2	....	....
5159	<i>t</i>	2	38	....	72	99	119	152	186	206	224	266
	<i>M</i>	8.80	9.94	....	11.07	12.52	13.0±	12.67	11.79	10.88	10.42	8.57
	<i>ΔM</i>	-0.07	-0.08	....	-0.30	+0.15	+0.27	-0.03	-0.17	-0.13	+0.39	-0.02
	No.	1	1	....	1	1	1	1	1	1	1	1
6005	<i>t</i>	....	....	....	....	....	....	165	....	....	....	....
	<i>M</i>	....	....	....	....	....	....	13.17	....	....	....	....
	<i>ΔM</i>	....	....	....	....	....	....	+0.67	....	....	....	....
	No.	....	....	....	....	....	....	1	....	....	....	....
6287	<i>t</i>	....	....	....	....	112	....	....	....	....	....	....
	<i>M</i>	....	....	....	....	12.81	....	....	....	....	....	....
	<i>ΔM</i>	....	....	....	....	+0.04	....	....	....	....	....	....
	No.	....	....	....	....	1	....	....	....	....	....	....
6251	<i>t</i>	....	....	....	....	....	....	....	....	....	....	....
	<i>M</i>	....	....	....	....	....	....	....	....	....	....	....
	<i>ΔM</i>	....	....	....	....	....	....	....	....	....	....	....
	No.	....	....	....	....	....	....	....	....	....	....	....
Means	<i>t</i>	9	34	57	79	105	128	150	173	199	220	253
	<i>M</i>	8.97	9.93	10.75	11.57	12.55	12.84	12.69	12.36	11.37	10.22	8.57
	<i>ΔM</i>	+0.02	+0.05	0.00	-0.03	+0.02	+0.05	+0.01	-0.09	+0.03	+0.10	-0.03
	No.	20	19	15	9	11	10	6	6	9	10	9

COMPLETE LIGHT-CURVE.

(Fig. 5, page 25.)

This is formed by platting the magnitudes (in the Harvard system) from Table 11, and indicating the limit of visibility when the variable was not seen by the point of the V-shaped character. A smooth curve drawn through the platted points shows the light changes of the variable. When the number of observations is insufficient to give an accurate curve, it is drawn with a broken line by the aid of the mean curve. The dates and magnitudes of maxima and minima given in Table 13 are taken from this light-curve. The correction to the ephemeris, given in the sixth column, is calculated from the elements at the head of the table, with the corrected period 284 days. The weight in the seventh column results from the number of observations combined with their symmetry with respect to the maximum or minimum. In case of a symmetrical distribution the weight is $\frac{3}{2}$ times the number. If the observations all lie on one side the weight is $\frac{1}{2}$ the number. In case the date of maximum or minimum depends on the mean curve, the letters "mc" are placed in the magnitude column.

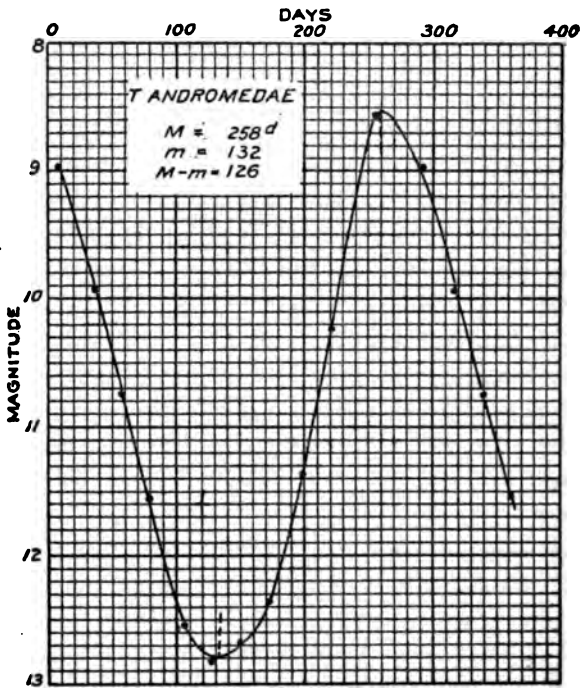


FIG. 6.—MEAN LIGHT-CURVE OF T ANDROMEDÆ.

TABLE 13.—103 T ANDROMEDÆ. OBSERVED MAXIMA AND MINIMA.
Elements of maximum. 1894 Nov. 28 (J. D. 2413161) + 284^d × (E - 51). M - m = 126^d

MAXIMA.							MINIMA.						
Epoch.	Date.		Mag.		Corr.	Wt.	Epoch.	Date.		Mag.		Corr.	Wt.
	Calendar.	J. D.	H.	P.				Calendar.	J. D.	H.	P.		
50	1894 Mar. 2	2890	....	mc	+ 13	6	51	1894 July 26	3036	....	mc	+ 1	2
51	Dec. 3	3166	8.49	8.57	+ 5	24	52	1895 May 6	3320	....	mc	+ 1	7
52	1895 Sept. 9	3446	8.58	8.66	+ 1	28	53	1896 Feb. 14	3604	....	mc	+ 1	6
53	1896 June 13	3724	....	mc	- 5	2	54	1896 Nov. 24	3888	12.90	12.98	+ 1	15
54	1897 Mar. 21	4005	....	mc	- 8	3	55	1897 Aug. 16	4153	12.82	12.90	- 18	17
55	Dec. 31	4290	8.30	8.38	- 7	13	56	1898 June 3	4444	....	mc	- 11	1
56	1898 Oct. 18	4581	8.32	8.40	0	10	57	1899 Mar. 11	4725	12.9	13.0	- 14	4
57	1899 July 22	4858	....	mc	- 7	4	58	Dec. 25	5014	12.90	12.98	- 9	20
58	1900 Apr. 29	5139	....	8.6	- 10	7	59	1900 Sept. 28	5291	13.00	13.08	- 16	10
59	1901 Feb. 2	5417	....	mc	- 16	2	62	1903 Feb. 14	6160	13.2	13.3	+ 1	1
64	1905 Jan. 14	6860	....	mc	+ 7	2	64	1904 Sept. 6	6730	....	mc	+ 3	5

TABLE 14.—PHOTOMETRIC MEASURES AND COLOR OF COMPARISON STARS.

Star.	H. C. O. 37,151	Lindemann +0.18 A. N. 139,345	H. M. Parkhurst A. J. 15,77	J. A. Parkhurst.		Yendell, Visual A. J. 15,93	Color, Plates 149 and 150	Hagen.
				H.	P.			
<i>a</i>	8.08	8.03	8.51	7.98	8.06	8.18	+0.37	8.1
<i>b</i>	8.45	8.80	8.76	8.72	8.80	8.10	-0.02	8.5
<i>c</i>	.....	.....	.....	9.51	9.59	9.07	-0.03	9.0
<i>d</i>	9.01	9.29	9.26	9.12	9.20	8.58	+0.11	8.8
<i>e</i>	.....	.....	.....	10.20	10.28	9.60	-0.08	9.7
<i>l</i>	.....	.....	.....	10.15	10.23	10.20	+0.11	9.9
<i>s</i>	10.62	.....	.....	10.32	10.40	.....	+0.10	10.0
<i>t</i>	12.34	.....	.....	11.66	11.74	.....	+0.08	12.4
<i>k</i>	12.50	.....	12.55	11.85	11.93	.....	-0.09	12.5
<i>x</i>	13.89	.....	.....	13.12	13.20	.....	.....	.....
<i>v</i>	.....	.....	.....	.....	.....	.....	+0.52	.....

Table 14 collects the other photometric measures of these comparison stars which are known to the writer, adding Hagen's and Yendell's visual scales and the measure of the color from a comparison of photographs taken on ordinary and isochromatic plates. The Harvard results in the second column reveal a considerable difference in scale, but reference to the volume cited shows that the measures of the four faint stars depend on the single star *d*, which seems too narrow a foundation. Again, before any larger aperture had been used on the field, the writer selected the comparison star *x* with the 6-inch reflector, whose limit of vision, as determined by all the photometer measures, lies between 12.8 and 13.0. If this is true the Harvard values for the faint stars are numerically too large by at least three-quarters of a magnitude.

Lindemann's results were based on the magnitude 6.50 for the star B. D. + 26°23 (P. DM. 6.68) and are therefore increased by 0.18 to bring them to the Potsdam system. They show a very close agreement with my values in column P.

H. M. Parkhurst's measures make the yellow star *a* about half a magnitude fainter than the other values. The Purkinje phenomenon would seem to explain the difference, as he used an extinction photometer, while the others used the full light of the star. A difference in scale is also indicated by the single faint star *k*, but this is entitled to a relatively small weight as it depends on only two double extinctions, while the other stars have six to nine; and in other fields our scales are in good agreement.

The writer's results are given in columns H and P on both the Harvard and Potsdam scales.

Yendell's visual scale is added for comparison. The color of the star *a* probably accounts for his estimating it with a 4.25-inch aperture fainter than the star *b*.

The "Color" column gives the difference: Magnitude on ordinary plate *minus* magnitude on isochromatic plate. It will be noticed that these differences are within the combined accidental errors of the visual and photographic measures, except for the stars *a* and *v*. At the present writing the data are insufficient for expressing these color numbers on the usual decimal scale, but an idea of their

relation can be had from the coloration of the variable given by Yendell, 5.2, and by the Gesellschaft Committee on Variables, 6.0.

Besides that here given, three light-curves have been published for the variable near maximum. The curve first published by Pickering in *Astrophysical Journal*, 1, 305, 1895, was anomalous in character, consisting of two straight lines meeting at the point of maximum. This curve has unfortunately gained some publicity and been widely quoted, but seems to lack confirmation. Pickering's second curve in the same journal, 3, 281, is of a different character and agrees with that given by Yendell in *Astronomical Journal*, 15, 93, also with the curve here given. As far as known, no other complete light-curve has been published, as observations near minimum have been scarce. Those published by H. M. Parkhurst in the *Astronomical Journal*, vols. 15 and 17, for epochs 53 and 54, number 9 and 8, respectively. In Harvard Annals, 37, 206, the minimum of epoch 38 was observed by Reed, who gives seven observations when the variable was fainter than the eleventh magnitude.

The period 284 days satisfies the present set of observations better than the shorter period 281 days given by Chandler, Pickering, and the Gesellschaft committee, and demanded by the B. D. observations of 1855. Hagen gives in the catalogue sheet to the "Atlas" the elements of maximum:

$$1891 \text{ December } 14 (2081) + 274 \text{ E.}$$

This period is so much too short that the calculated maximum 17 falls at Julian day 6739, only nine days after the observed minimum.

We conclude that at present the period is lengthening.

CHAPTER III.

267 V ANDROMEDÆ.

R. A. $0^{\text{h}} 44^{\text{m}} 39.7^{\text{s}}$; Dec. $+35^{\circ} 6' 30''$ (1900).

The announcement of the discovery of this variable by Anderson was received in the *Astronomische Nachrichten*, 142, 159, in January, 1897. Observations began at once and the definitive notation was published by Chandler in *Astronomical Journal*, 17, 87, February, 1897. Some confusion arose from an apparent contradiction between the observations of Yendell and the writer (noted by Hartwig in the *Vierteljahrsschrift*, 32, 187), occasioned by a misidentification explained in *Astronomical Journal*, 8, 62. Some trouble may also arise from the fact that the Chandler number of the star is given as 268 in the *Nachrichten*, 160, 335, and in the Harvard *Provisional Catalogue of Variables*, Annals, 48, 96, whereas that number was assigned by Chandler to X Sculptoris in the *Journal*, 17, 88.

As Hartwig's observations of the star are not yet published, there are only available for comparison three isolated observations by Esch in the *Nachrichten*, 160, 335, the star being found invisible in February, 1902 (then 13^{m} by my curve) and 9.3^{m} , 1902 August 22.

The positions of the variable (relative to the star *a*, in Leyden A. G. Cat.) and the brighter comparison stars were measured with the 6-inch, the fainter stars with the 40-inch, and all positions were checked from the photograph.

The three fundamental magnitude stars (Table 15) are white, which perhaps accounts for the small residuals and the close agreement of the results with the Potsdam values.

The mean light-curve was formed from the observations up to February, 1905. It bears a close resemblance to that of T Andromedæ, the only difference being the length of the period. No halting in the regular change has been observed, but there is a range of more than a magnitude in the brightness at different maxima and half a magnitude at the minima. A pair of ordinary and isochromatic plates taken 1904 November 15, showed no color difference between the variable and the comparison stars *d*, *e*, and *m*.

The revised elements given by Chandler in *Astronomical Journal*, 18, 94,

$$\text{Max.} = 1896 \text{ Nov. } 5 \text{ (3869)} + 263 \text{ E}$$

as well as Hartwig's ephemeris in *Vierteljahrsschrift*, 39, 262, call for a maximum epoch 12, 1905 June 28. The observed date, May 5, though dependent on a small number of observations, does not seem liable to an error greater than 10 days, so that the Chandler period is evidently too long. The present set of observations are best satisfied by a period of 259 days, as given at the head of Table 23.

TABLE 15.—STANDARD MAGNITUDE STARS.

Star.	B. D. No.	1900.				Color, P. DM.	Magnitude.				Residuals.		
		R. A.			Dec.		Catalogue.		Measured.		From Cats.		3 Nights inter se.
							H.C.O.	P. DM.	H.	P.	H.	P.	
		h	m	s	°								
B'	° + 35 146	0	42	34	+ 35 39.5	W+	8.02	8.23	7.93	8.22	-9	-1	± 2
E'	+ 35 145	0	42	33	+ 35 56.6	W+	7.80	8.03	7.74	8.03	-6	0	± 2
F'	+ 34 148	0	50	45	+ 34 40.9	W	6.82	7.26	6.98	7.27	+16	+1	± 2
Mean...		.....			.....	.....	7.55	7.84	7.55	7.84	±10	±1	± 2

TABLE 16.—COMPARISON STARS IN B. D. CATALOGUE.

Star.	B. D.		1855.				Star.	B. D.		1855.			
	No.	Mag.	R. A.		Dec.	No.		Mag.	R. A.		Dec.		
			h	m					s	°		'	h	m	s	°	'
y	+ 34 120	9.0	0	41	36	+ 34 38.5	l	+ 34 131	9.2	0	43	22	+ 34 55.7
s	+ 34 121	8.4	0	42	6	+ 34 32.5	E	+ 34 132	9.1	0	43	24	+ 34 45.7
a	+ 34 126	9.1	0	42	31	+ 34 45.9	A	+ 35 154	8.9	0	43	24	+ 35 3.6
b	+ 34 127	8.3	0	42	46	+ 34 39.0							

TABLE 17.—COMPARISON STARS FOR V ANDROMEDÆ (IN ORDER OF RIGHT ASCENSION).

Star.	Coordinates from Variable.			Light Scale, Steps.	Magnitude.			
	R. A.		Dec.		Measured.		From Curve.	
	"	s	"		H.	P.	H.	P.
y	-442	-36.0	-777	41.5	9.27	9.56	.....	.....
r	-408	-33.3	-275	.....	.....	.....	12±	.....
u	-388	-31.6	+342	26.1	.....	.....	11.29	11.58
w	-374	-30.5	+206	25.1	.....	.....	11.42	11.71
q	-315	-25.7	-255	.....	.....	.....	12±	.....
t	-286	-23.3	+291	25.1	.....	.....	11.42	11.71
p	-272	-22.2	-323	.....	.....	.....	11.5±	.....
A	-172	-14.1	-165	16.0	.....	.....	12.5	12.8
s	-75	-6.1	-1156	.....	8.23	8.52	.....	.....
s	-68	-5.5	+396	23.1	.....	.....	11.68	11.97
h	-53	-4.3	-187	17.7	.....	.....	12.34	12.63
g	-12	-1.0	-156	20.4	.....	.....	12.00	12.29
C	+16	+1.3	+90	4.7	13.82	14.11	.....	.....
B	+115	+9.4	+152	11.5	13.04	13.33	.....	.....
h	+119	+9.7	+547	.....	.....	.....	9±	.....
E	+132	+10.8	-26	9.1	13.46	13.75	.....	.....
D	+139	+11.3	+96	0	14.26	14.55	.....	.....
d	+194	+15.8	+74	23.0	11.83	12.12	.....	.....
j	+224	+18.3	-748	31.1	10.41	10.70	.....	.....
a	+235	+19.2	-354	37.4	9.91	10.20	.....	.....
m	+258	+21.0	-107	20.9	12.24	12.53	.....	.....
e	+325	+26.5	-185	26.5	11.26	11.55	.....	.....
b	+423	+34.5	-765	44.6	8.81	9.10	.....	.....
o	+473	+38.5	+51	23.9	.....	.....	11.58	11.87
n	+549	+44.7	-15	.....	.....	.....	11.17	11.46
i	+846	+68.9	+296	41.4	.....	.....	9.32	9.61
A'	+883	+72.0	+714	43.9	.....	.....	8.98	9.27

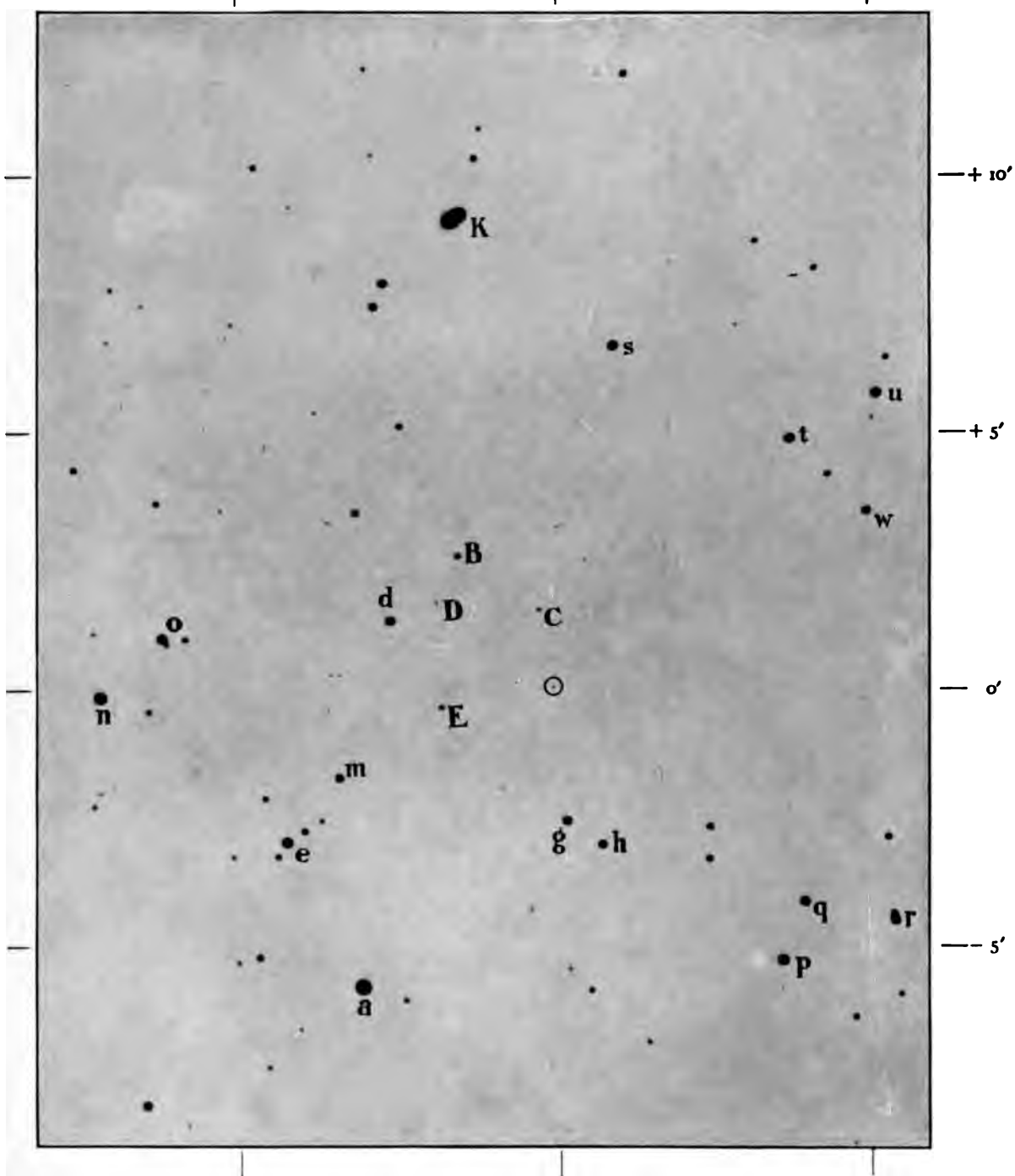
STELLAR PHOTOMETRY.

PLATE 3.

+ 30°

N
0°

- 30°



Scale, 1 mm = 7".5.

S

1905 January 27.

267 V ANDROMEDÆ.

R. A. $0^h 44^m 39^s.7$. Dec. $+35^\circ 6' 30''$, 1900.

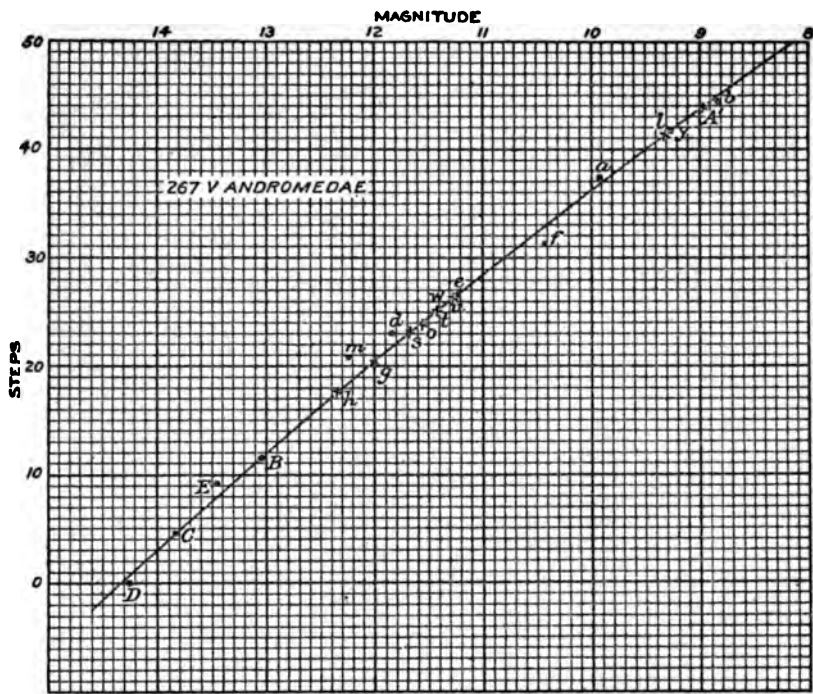


FIG. 7.—MAGNITUDE-CURVE FOR V ANDROMEDÆ.

TABLE 18.—267 V ANDROMEDÆ. PHOTOMETER MEASURES OF COMPARISON STARS.

1904 October 6.		6-INCH.				Fine.		
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
<i>h m</i> 22 53	22	<i>E'</i>	13.0 12.3 13.0	12.77	12.95	0.63	7.77	8.06
		<i>B'</i>	13.8 14.0 13.7	13.83	13.87	0.77	7.91	8.20
		<i>y</i>	24.9 25.2 25.1	25.07	25.04	2.13	9.27	9.56
		<i>z</i>	16.9 18.1 17.5	17.50	18.55	1.42	8.56	8.85
		<i>b</i>	20.0 21.0 21.3	20.77	21.24	1.74	8.88	9.17
		<i>a</i>	27.4 28.5 28.3	28.07	28.64	2.52	9.66	9.95
		<i>v</i>	35.3 35.0 35.7	35.33	.....	3.38	10.52	10.81
		<i>F'at</i>	12.8 12.8 12.7	12.77	12.54	0.57	7.71	8.00
		<i>F'at</i>	12.0 12.2 12.7	12.30	.....	.....	.....	.....
		<i>a</i>	29.0 28.8 29.8	29.20	.....	.....	.....	.....
		<i>b</i>	21.7 21.3 22.1	21.70	.....	.....	.....	.....
		<i>z</i>	20.0 19.7 19.1	19.60	.....	.....	.....	.....
		<i>y</i>	25.0 25.1 24.9	25.00	.....	.....	.....	.....
		<i>B'</i>	13.7 14.0 14.0	13.90	.....	.....	.....	.....
		<i>E'</i>	13.1 13.1 13.2	13.13	.....	.....	.....	.....
23 14	19							

TABLE 18.—267 V ANDROMEDÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1904 October 30.			6-INCH.				Good.		
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.		
				Mean of 3.	Mean of 6.		H.	P.	
<i>h m</i>	<i>°</i>								
21 29	38	<i>E'</i>	12.8 13.6 13.1	13.17	13.99	0.77	7.71	8.00	
		<i>B'</i>	15.1 15.2 15.7	15.33	15.30	0.98	7.92	8.21	
		<i>y</i>	28.3 28.9 28.3	28.50	28.34	2.49	9.43	9.72	
		<i>z</i>	18.4 18.2 19.1	18.57	19.02	1.47	8.41	8.70	
		<i>b</i>	22.0 23.1 23.2	22.77	23.29	1.96	8.90	9.19	
		<i>a</i>	31.2 31.2 30.9	31.10	31.95	2.92	9.86	10.15	
		<i>v</i>	49.7 49.3 49.4	49.47	.....	4.66	11.60	11.89	
		<i>F'</i>	5.5 6.1 6.1	5.90	.....	0.02	6.96	7.25	
		<i>F' a1</i>	14.9 14.1 14.1	14.37	14.24	0.83	7.77	8.06	
		<i>F' a1</i>	13.7 14.3 14.3	14.10	.....	.....	.....	.....
		<i>a</i>	32.8 32.9 32.7	32.80	.....	.....	.....	.....
		<i>b</i>	24.1 23.1 24.2	23.80	.....	.....	.....	.....
		<i>z</i>	19.7 18.9 19.8	19.47	.....	.....	.....	.....
		<i>y</i>	28.0 28.2 28.3	28.17	.....	.....	.....	.....
		<i>B'</i>	15.7 15.0 15.1	15.27	.....	.....	.....	.....
21 51	34	<i>E'</i>	15.0 14.8 14.6	14.80	.....	.....	.....	.....
1904 October 30.			Quiet, dull.						
23 23	20	<i>b</i>	25.8 26.7 26.7	26.40	25.82	2.23	8.82	9.11	
		<i>a</i>	33.9 34.3 33.9	34.03	33.55	3.13	9.72	10.01	
		<i>z</i>	19.2 21.2 20.2	20.20	20.60	1.66	8.25	8.54	
		<i>y</i>	28.1 27.8 28.1	28.00	29.17	2.58	9.17	9.46	
		<i>B'</i>	18.1 17.9 17.8	17.93	18.15	1.37	7.96	8.25	
		<i>E'</i>	15.9 16.0 16.5	16.13	16.55	1.16	7.75	8.04	
		<i>E'</i>	17.1 16.7 17.1	16.97	.....	.....	.....	.....
		<i>B'</i>	18.3 18.1 18.7	18.37	.....	.....	.....	.....
		<i>y</i>	30.9 30.1 30.0	30.33	.....	.....	.....	.....
		<i>z</i>	21.1 20.9 21.0	21.00	.....	.....	.....	.....
		<i>a</i>	33.3 32.6 33.3	33.07	.....	.....	.....	.....
		<i>b</i>	25.2 25.0 25.5	25.23	.....	.....	.....	.....
		<i>F'</i>	11.1 11.0 11.1	11.07	.....	.....	.....	.....
23 41	18	<i>F'</i>	10.0 10.8 10.1	10.30	10.69	0.36	6.95	7.24	
1904 September 11.			12-INCH.				Good.		
21 8	42	<i>y</i>	17.8 17.6 17.1	17.50	17.30	1.38	9.28	9.57	
		<i>z</i>	9.8 9.7 8.7	9.40	9.25	0.36	8.26	8.55	
		<i>f</i>	27.8 27.0 28.1	27.63	28.48	2.50	10.40	10.69	
		<i>b</i>	13.1 13.2 14.0	13.43	14.00	0.92	8.82	9.11	
		<i>a</i>	24.1 23.8 24.1	24.00	23.47	2.06	9.96	10.25	
		<i>e</i>	34.9 35.2 35.8	35.30	36.02	3.32	11.22	11.51	
		<i>m</i>	44.1 44.3 44.0	44.13	44.03	4.22	12.12	12.41	
		<i>d</i>	40.9 40.7 41.2	40.93	39.70	3.75	11.65	11.94	
		<i>v</i>	25.7 25.0 25.5	25.40	.....	2.24	10.14	10.43	
		<i>d</i>	37.9 39.2 38.3	38.47	.....	.....	.....	.....
		<i>m</i>	43.3 44.1 44.4	43.93	.....	.....	.....	.....
		<i>e</i>	36.1 37.3 36.8	36.73	.....	.....	.....	.....
		<i>a</i>	23.0 23.1 22.7	22.93	.....	.....	.....	.....
		<i>b</i>	14.7 14.3 14.7	14.57	.....	.....	.....	.....
		<i>f</i>	29.2 29.4 29.4	29.33	.....	.....	.....	.....
		<i>z</i>	8.6 9.7 9.0	9.10	.....	.....	.....	.....
21 29	38	<i>y</i>	17.1 16.8 17.4	17.10	.....	.....	.....	.....

TABLE 18.—267 V ANDROMEDÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1904 October 30.			12-INCH.				Good.		
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.		
				Mean of 3.	Mean of 6.		H.	P.	
<i>h m</i>	<i>°</i>								
22 30	27	<i>y</i>	15.8 16.3 16.0	15.03	14.75	1.02	9.14	9.43	
		<i>z</i>	7.8 8.1 8.7	8.20	7.52	0.21	8.33	8.62	
		<i>b</i>	12.4 13.1 13.1	12.87	12.64	0.75	8.87	9.16	
		<i>f</i>	24.8 25.8 24.0	24.87	25.90	2.27	10.39	10.68	
		<i>a</i>	20.0 20.0 20.0	20.00	21.24	1.85	9.97	10.26	
		<i>e</i>	35.0 35.1 34.8	34.97	33.82	3.06	11.18	11.47	
		<i>m</i>	41.7 42.0 42.0	41.90	41.80	3.98	12.10	12.39	
		<i>d</i>	37.8 39.1 39.2	38.70	38.75	3.63	11.75	12.04	
		<i>v</i>	33.0 33.9 33.8	33.57	.....	3.03	11.15	11.44
		<i>d</i>	38.7 38.5 39.2	38.80	.....	.....	.....	.....
		<i>m</i>	42.3 40.9 41.9	41.70	.....	.....	.....	.....
		<i>e</i>	32.2 33.0 32.8	32.67	.....	.....	.....	.....
		<i>a</i>	22.7 22.3 22.4	22.47	.....	.....	.....	.....
		<i>f</i>	27.2 26.3 27.3	26.93	.....	.....	.....	.....
		22 50	23	<i>b</i>	12.0 12.8 12.4	12.40
<i>z</i>	5.9 6.9 7.7			6.83	.....	.....	.....	.....
<i>y</i>	14.0 14.6 14.8			14.47	.....	.....	.....	.....
1904 November 1.						Good.			
21 15	40	<i>y</i>	23.1 23.9 23.7	23.57	24.14	2.12	9.28	9.57	
		<i>z</i>	16.2 15.9 15.0	15.70	15.45	1.11	8.27	8.56	
		<i>b</i>	21.8 21.3 20.7	21.27	20.55	1.77	8.93	9.22	
		<i>f</i>	35.1 35.9 34.3	35.10	35.67	3.27	10.43	10.72	
		<i>a</i>	30.2 29.8 29.8	29.93	30.25	2.68	9.84	10.13	
		<i>e</i>	43.6 44.2 43.9	43.90	43.62	4.17	11.33	11.62	
		<i>d</i>	52.3 52.9 52.3	52.50	51.25	4.93	12.09	12.38	
		<i>m</i>	55.5 56.7 57.4	56.53	55.97	5.29	12.45	12.74	
		<i>v</i>	46.1 45.9 45.0	45.67	.....	4.40	11.56	11.85
		<i>m</i>	55.0 55.5 55.7	55.40	.....	.....	.....	.....
		<i>d</i>	50.1 50.1 49.8	50.00	.....	.....	.....	.....
		<i>e</i>	43.0 43.9 43.1	43.33	.....	.....	.....	.....
		<i>a</i>	30.7 30.3 30.7	30.57	.....	.....	.....	.....
		<i>f</i>	36.7 36.0 36.0	36.23	.....	.....	.....	.....
		21 33	37	<i>b</i>	19.9 19.8 19.8	19.83
<i>z</i>	15.0 15.5 15.1			15.20	.....	.....	.....	.....
<i>y</i>	25.0 24.4 24.7			24.70	.....	.....	.....	.....
1904 November 2.						Fair to good.			
21 57	33	<i>y</i>	22.0 21.7 21.7	21.80	21.94	1.91	9.38	9.67	
		<i>z</i>	13.8 15.0 14.2	14.33	13.45	0.59	8.06	8.35	
		<i>b</i>	19.8 18.3 19.2	19.10	18.62	1.55	9.02	9.31	
		<i>f</i>	33.7 32.7 34.1	33.50	32.85	2.95	10.42	10.71	
		<i>a</i>	27.0 28.1 28.3	27.80	27.22	2.39	9.86	10.15	
		<i>e</i>	42.9 41.7 41.8	42.13	41.27	3.92	11.39	11.68	
		<i>m</i>	51.4 51.2 51.0	51.20	51.17	4.92	12.39	12.68	
		<i>d</i>	46.5 46.3 46.6	46.47	46.47	4.46	11.93	12.22	
		<i>v</i>	39.3 40.8 40.2	40.10	.....	3.80	11.27	11.56
		<i>d</i>	46.5 46.9 46.0	46.47	.....	.....	.....	.....
		<i>m</i>	50.9 51.2 51.3	51.13	.....	.....	.....	.....
		<i>e</i>	40.0 41.2 40.0	40.40	.....	.....	.....	.....
		<i>a</i>	26.1 27.0 26.8	26.63	.....	.....	.....	.....
		<i>f</i>	32.5 31.8 32.3	32.20	.....	.....	.....	.....
		22 18	29	<i>b</i>	17.7 18.1 18.6	18.13
<i>z</i>	11.9 12.8 13.0			12.57	.....	.....	.....	.....
<i>y</i>	21.7 22.2 22.3			22.07	.....	.....	.....	.....
1904 November 3.						Good.			

TABLE 18.—267 V ANDROMEDÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1902 February 12.			40-INCH.				Fair to good.		
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.		
				Mean of 3.	Mean of 6.		H.	P.	
<i>h m</i>	°								
4 42		<i>e</i>	17.5 18.0 19.0	18.17	17.09	1.35	11.42	11.71	
		<i>m</i>	24.8 25.2 25.0	25.00	24.39	2.15	12.22	12.51	
		<i>d</i>	19.2 20.0 19.3	19.50	19.97	1.69	11.76	12.05	
		<i>D</i>	38.8 39.7 40.1	39.53	.....	3.72	13.79	14.08
		<i>B</i>	31.8 32.8 32.0	32.20	.....	2.88	12.95	13.24
		<i>C</i>	37.1 38.2 37.0	37.43	.....	3.48	13.55	13.84
		<i>v</i>	30.8 32.3 32.0	31.70	.....	2.83	12.90	13.19
		<i>E</i>	35.0 35.3 34.8	35.03	.....	3.20	13.27	13.56
		<i>d</i>	19.5 21.8 20.0	20.43	.....	.....	.....	.....
		<i>m</i>	23.2 24.4 23.7	23.77	.....	.....	.....	.....
		<i>e</i>	16.0 15.9 16.1	16.00	.....	.....	.....	.....
		<i>e</i> ₂₂	27.2 28.1 27.2	27.50	.....	2.42	.....	.....
		<i>d</i> ₂₁	32.8 31.7 33.8	32.77	.....	2.95	.....	.....
1902 December 26.									
Clear, unsteady.									
2 45		<i>e</i>	21.4 22.8 22.5	22.23	23.78	2.10	11.17	11.46	
		<i>m</i>	36.4 35.8 35.8	36.00	36.10	3.32	12.39	12.68	
		<i>d</i>	29.9 30.9 31.0	30.60	31.27	2.78	11.85	12.14	
		<i>D</i>	58.7 57.2 58.2	58.03	56.93	5.34	14.41	14.70	
		<i>B</i>	42.2 43.6 44.6	43.47	44.54	4.28	13.35	13.64	
		<i>C</i>	52.5 53.3 53.7	53.17	53.89	5.15	14.22	14.51	
		<i>v</i>	47.2 45.2 48.2	46.87	.....	4.50	13.57	13.86
		<i>E</i>	49.9 49.8 49.7	49.80	49.99	4.80	13.87	14.16	
		<i>E</i>	49.9 50.8 49.8	50.17	.....	.....	.....	.....
		<i>C</i>	54.2 53.8 55.8	54.60	.....	.....	.....	.....
		<i>B</i>	45.8 45.2 45.8	45.60	.....	.....	.....	.....
		<i>D</i>	54.7 55.7 57.2	55.83	.....	.....	.....	.....
		<i>d</i>	31.3 32.8 31.7	31.93	.....	.....	.....	.....
		<i>m</i>	35.4 36.2 37.0	36.20	.....	.....	.....	.....
		<i>e</i>	25.0 26.0 25.0	25.33	.....	.....	.....	.....
3 25		<i>e</i> ₂₂	39.8 40.7 40.2	40.23	.....	3.80	.....	.....
1905 January 28.									
Good.									
4 55	49	<i>e</i>	18.3 19.8 20.0	19.37	18.44	1.50	11.53	11.82	
		<i>m</i>	24.0 24.5 24.4	24.30	23.08	2.04	12.07	12.36	
		<i>d</i>	21.9 22.2 22.8	22.30	20.62	1.78	11.81	12.10	
		<i>B</i>	34.6 33.2 34.2	34.00	33.16	3.00	13.03	13.32	
		<i>D</i>	44.1 45.1 45.8	45.00	44.76	4.30	14.33	14.62	
		<i>E</i>	37.8 38.8 37.3	37.97	36.22	3.33	13.36	13.65	
		<i>v</i>	35.0 37.0 36.0	36.00	36.18	3.33	13.36	13.65	
		<i>C</i>	40.2 40.8 40.7	40.57	40.34	3.81	13.84	14.13	
		<i>C</i>	40.1 40.3 39.9	40.10	.....	.....	.....	.....
		<i>v</i>	37.7 36.0 36.0	36.57	.....	.....	.....	.....
		<i>E</i>	34.1 34.1 35.2	34.47	.....	.....	.....	.....
		<i>D</i>	43.9 44.5 45.2	44.53	.....	.....	.....	.....
		<i>B</i>	34.2 32.0 31.8	32.33	.....	.....	.....	.....
		<i>d</i>	19.0 18.7 19.1	18.93	.....	.....	.....	.....
		<i>m</i>	22.5 21.8 21.3	21.87	.....	.....	.....	.....
5 17	53	<i>e</i>	17.2 17.8 17.5	17.50	.....	.....	.....	.....

TABLE 18.—267 V ANDROMEDÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1905 January 31.			40-INCH.				Good.		
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.		
				Mean of 3.	Mean of 6.		H.	P.	
<i>h m</i>	<i>°</i>								
4 50	50	<i>e</i>	26.1 27.2 26.4	26.57	24.30	2.14	11.55	11.84	
		<i>m</i>	33.0 33.1 33.0	33.03	30.93	2.75	12.16	12.45	
		<i>d</i>	27.2 28.0 27.7	27.63	25.76	2.27	11.68	11.97	
		<i>B</i>	39.8 40.1 40.4	40.10	38.40	3.59	13.00	13.29	
		<i>D</i>	52.2 53.7 52.8	52.90	52.00	4.99	14.40	14.69	
		<i>E</i>	44.0 44.3 44.0	44.10	43.00	4.11	13.52	13.81	
		<i>v</i>	40.8 41.8 41.7	41.43	41.52	3.95	13.36	13.65	
		<i>C</i>	44.8 46.9 45.9	45.87	45.50	4.38	13.79	14.08	
		<i>C</i>	45.6 44.8 45.0	45.13	.....	.....	.....	.....
		<i>v</i>	41.7 41.6 41.5	41.60	.....	.....	.....	.....
		<i>E</i>	42.4 41.4 41.9	41.90	.....	.....	.....	.....
		<i>D</i>	52.2 52.6 51.5	51.10	.....	.....	.....	.....
		<i>B</i>	36.0 37.9 36.2	36.70	.....	.....	.....	.....
		<i>d</i>	23.7 24.3 23.7	23.90	.....	.....	.....	.....
		<i>m</i>	28.8 27.7 30.0	28.83	.....	.....	.....	.....
5 04	52	<i>e</i>	21.6 21.8 22.7	22.03	.....	.....	.....	.....

TABLE 19.—267 V ANDROMEDÆ. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

6-INCH.															
Star.	1904 October 6.					1904 October 30.					1904 October 30.				
	C.	Obs. Mag.		Δ Mag.		C.	Obs. Mag.		Δ Mag.		C.	Obs. Mag.		Δ Mag.	
		H.	P.	H.	P.		H.	P.	H.	P.		H.	P.	H.	P.
B'.....	0.77	7.91	8.20	-.11	-.03	0.98	7.92	8.21	-.10	-.02	1.37	7.96	8.25	-.06	+.02
E'.....	0.63	7.77	8.06	-.03	+.03	0.77	7.71	8.00	-.09	-.03	1.16	7.75	8.04	-.05	+.01
F'.....	0.18	6.96	7.25	+.14	-.01	0.08	7.02	7.31	+.20	+.06	0.36	6.95	7.24	+.13	-.02
Means...	0.41	7.55	7.84	±.09	±.02	0.61	7.55	7.84	±.13	±.04	0.96	7.55	7.84	±.08	±.02
M ₀.....	....	7.14	7.43	...	...	....	6.94	7.23	...	...	....	6.59	6.88	...	...

12-INCH.						40-INCH.					
Star.	Mag. 6-inch.	C.				Star.	Mag. 12-inch.	C.			
		Sept 11.	Oct 30	Nov. 1.	Nov. 2.			Feb. 12.	Dec. 26.	Jan. 28.	Jan. 31.
a.....	9.75	2.06	1.85	2.68	2.39	d.....	11.85	1.69	2.78	1.78	2.27
b.....	8.87	0.92	0.75	1.77	1.55	e.....	11.28	1.35	2.10	1.50	2.14
γ.....	9.29	1.38	1.02	2.12	1.91	m.....	12.26	2.15	3.32	2.04	2.75
z.....	8.41	0.36	0.21	1.11	0.59						
Mean C ..	....	1.18	0.96	1.92	1.61	Mean C ..	....	1.73	2.73	1.77	2.39
Mean Mag.	9.08	9.08	9.08	9.08	9.08	Mean Mag.	11.80	11.80	11.80	11.80	11.80
M ₀.....	....	7.90	8.12	7.16	7.47	M ₀.....	....	10.07	9.07	10.03	9.41

TABLE 20.—267 V ANDROMEDÆ. MEAN MAGNITUDES.

6-INCH.											
Star.	October 6.		October 30.		October 30.		Mag.	Δ Mag.	Mean.		
	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.			Mag. H.	Mag. P.	Δ Mag.
B'...	7.91	−0.02	7.92	−0.01	7.96	+0.03	....	....	7.93	8.22	±0.02
E'...	7.77	+0.03	7.71	−0.03	7.75	+0.01	....	....	7.74	8.03	±0.02
F'...	6.96	−0.02	7.02	+0.04	6.95	−0.03	....	....	6.98	7.27	±0.02
Mean.	.....	.....	.....	.....	.....	.....	.....	.....	7.55	7.84	±0.02
a....	9.66	−0.09	9.86	+0.11	9.72	−0.03	....	....	9.75	10.04	±0.08
b....	8.88	+0.01	8.90	+0.03	8.82	−0.05	....	....	8.87	9.16	±0.03
y....	9.27	−0.02	9.43	+0.14	9.17	−0.12	....	....	9.29	9.58	±0.09
z....	8.56	+0.15	8.41	0.00	8.25	−0.16	....	....	8.41	8.70	±0.10
Mean.	.....	.....	.....	.....	.....	.....	.....	.....	9.08	9.38	±0.08
12-INCH.											
Star.	September 11.		October 30.		November 1.		November 2.		Mean.		
	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag. H.	Mag. P.	Δ Mag.
a....	9.96	+0.05	9.97	+0.06	9.84	−0.07	9.86	−0.05	9.91	10.20	±0.06
b....	8.82	−0.09	8.87	−0.04	8.93	+0.02	9.02	+0.11	8.91	9.20	±0.06
y....	9.28	+0.01	9.14	−0.13	9.28	+0.01	9.38	+0.11	9.27	9.56	±0.06
z....	8.26	+0.03	8.33	+0.10	8.27	+0.04	8.06	−0.17	8.23	8.52	±0.08
Mean.	.....	.....	.....	.....	.....	.....	.....	.....	9.08	9.37	±0.06
e....	11.22	−0.06	11.18	−0.10	11.33	+0.05	11.39	+0.11	11.28	11.57	±0.08
d....	11.65	−0.20	11.75	−0.10	12.09	+0.24	11.93	+0.08	11.85	12.14	±0.15
m....	12.12	−0.14	12.10	−0.16	12.45	+0.19	12.39	+0.13	12.26	12.55	±0.14
j....	10.40	−0.01	10.39	−0.02	10.43	+0.02	10.42	+0.01	10.41	10.70	±0.01
Mean.	.....	.....	.....	.....	.....	.....	.....	.....	11.46	11.75	±0.10
40-INCH.											
Star.	February 12.		December 26.		January 28.		January 31.		Mean.		
	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag. H.	Mag. P.	Δ Mag.
d....	11.76	0.00	11.85	+0.04	11.81	+0.05	11.68	−0.08	11.76	12.05	±0.06
e....	11.42	−0.04	11.17	−0.16	11.53	+0.07	11.55	+0.09	11.46	11.75	±0.11
m....	12.22	+0.04	12.39	+0.12	12.07	−0.11	12.16	−0.02	12.18	12.47	±0.08
Mean.	.....	.....	.....	.....	.....	.....	.....	.....	11.80	12.09	±0.08
h....	12.95	−0.11	13.35	+0.09	13.03	−0.03	13.00	−0.06	13.06	13.35	±0.06
c....	13.55	−0.29	14.22	+0.05	13.84	0.00	13.79	−0.05	13.84	14.13	±0.03
l....	13.79	−0.49	14.41	−0.18	14.33	+0.05	14.40	+0.12	14.28	14.57	±0.12
k....	13.27	−0.21	13.87	+0.09	13.36	−0.12	13.52	+0.04	13.48	13.77	±0.06
Mean.	.....	.....	.....	.....	.....	.....	.....	.....	13.66	13.95	±0.07

TABLE 21.—267 V ANDROMEDÆ. VISUAL OBSERVATIONS OF THE VARIABLE.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day. G. M. T.					Steps.	Mag.			
	1897		2410000+									
1	Jan. 19	8	3944.58	80	6	/2v, v1-2e	29.1, 28.0	28.5	11.00	moon	0	-0.33
2	21	8	3946.58	40	6	v not seen				poor	2	....
3	22	7	3947.54	150	6	v3d, v0-1e, /4v	26.0, 27.0, 27.1	26.7	11.25	good	3	-0.23
4	28	7	3953.54	...	6	e2-3v, v2d, vg, v1-2h	24.0, 25.0, 20.4, 19.2	22.1	11.79	....	9	+0.12
5	30	7	3955.54	150	6	vd, v1-2h	23.0, 19.2	21.1	11.91	fair	11	+0.16
6	May 24	15	4069.88	150	6	d glimpsed, v not seen		<23	<11.7	fair	126	....
7	July 21	10	4127.67	150	6	v4f, a3v	35.1, 34.4	34.7	10.21	good	184	+0.87
8	27	10	4133.67	40	6	v1a, l2-3v	38.4, 38.9	38.6	9.69	good	190	+0.36
9	Aug. 3	9	4140.63	40	6	l4-5v, va, v6f	36.4, 37.4, 37.1	36.9	9.91	fair	197	+0.49
10	8	16	4145.92	40	6	l4v	37.4			poor	202	+0.52
11	11	9	4148.63	80	6	a2v, v4f	35.4, 35.1	35.9	10.04	....	205	+0.50
12	19	9	4156.63	150	6	a2v, v5f	35.4, 36.1	35.7	10.08	....	213	+0.51
13	27	9	4164.63	150	6	a3v, v3f	34.4, 34.1	34.2	10.28	good	221	+0.40
14	Sept. 5	7	4173.54	40	6	a5v, v3f	32.4, 34.1	33.4	10.37	good	230	+0.65
15	13	8	4181.58	150	6	a4v, v2-3f	33.4, 33.6	29.1	10.91	moon	238	+0.32
16	16	7	4184.54	150	6	a10v, v1-2f	27.4, 29.6	27.1	11.18	fair	240	+0.52
17	18	9	4186.63	150	6	/2v, v limit	26.6, 28.5, 26.4			....	...	....
18	20	8	4188.58	150	6	/4-5v, v2e, v6g {b6a, a10f, /2e, /h, n30 {e5m, e2d, d4g, g2h {/5v, v1-2e, v4d, v1t, vu... {v3s, n4e, e3d, d4o, o3m... {t3v, d3g, g2h, p4q, p1-2r {p2v, limit 4 < m	26.1, 28.0, 27.0, 26.1 26.1, 26.1	26.5	11.26	....	244	+0.45
19	21	17	4189.96	150	6	e1v, v3d	25.5, 26.0	25.7	11.35	good	246	+0.43
20	25	8	4193.58	150	6	e4v, v1d, v1g	22.5, 24.0, 21.4	22.9	11.70	good	250	+0.67
21	29	7	4197.56	150	6	e3-4v, v1d, v2g	23.0, 24.0, 22.4	23.1	11.67	good	254	+0.50
22	30	16	4198.94	150	6	d1v, vg, v2h	22.0, 20.4, 19.7	20.7	11.97	good	255	+0.76
23	Oct. 14	7	4212.54	150	6	g4v, m3v, v limit	16.4, 17.9	17.1	12.40	good	10	+0.69
24	25	7	4223.54	150	6	g5v, m4v, limit v	15.4, 16.9	16.1	12.51	good	21	+0.41
25	Nov. 16	7	4245.54	150	6	v not seen, limit 5 < d		<18	<12.3	fine	43	....
26	Dec. 29	7	4288.54	150	6	v not seen, limit 1-2 < g		<19	<12.2	moon	86	....
	1898											
27	Jan. 16	7	4306.54	150	6	v not seen, limit g and h		<19	<12.2	good	104	....
28	18	7	4308.54	150	6	v not seen, limit 1 < g		<19	<12.2	good	106	....
29	Feb. 15	8	4336.58	150	6	v2m, n2v, /2-3v	22.9, 25.2, 28.6	25.5	11.37	good	134	+0.03
30	23	7	4344.54	150	6	v2-3f, v2n, a6-7v	33.6, 29.2, 30.9	31.2	10.67	good	142	-0.24
31	Mar. 4	7	4353.54	40	6	a5-6v, v2n	31.9, 29.2	31.2	10.67	fair	151	+0.16
32	13	7	4362.54	150	6	a5v, v4n	32.4, 31.2			....	...	....
33	16	7	4365.54	40	6	a2v, v10e, v7f, v6n, n1f	35.4, 36.5, 38.1, 33.2	35.8	10.08	good	160	-0.09
34	23	7	4372.54	40	6	a1v, y3v, l3v	36.4, 38.5, 38.4	37.7	9.81	good	163	-0.25
35	28	7	4377.54	40	6	v4-5a, vb, z2v, v3y, v3l	{41.9, 44.6, 43.8 {44.5, 44.4	43.8	9.00	fair	170	-0.80
36	Apr. 15	16	4395.92	40	6	z1-2v, v4y, v3l, v2A'	44.3, 45.5, 44.4, 45.9	45.0	8.81	good	175	-0.79
37	June 27	13	4468.89	80	12	vz±, difficult		46±	8.7±	poor	194	-0.7±
38	July 6	11	4477.71	80	12	d1v, v1m, v4A	22.0, 19.9, 20.0	20.6	11.98	good	9	+0.30
39	12	11	4483.71	275	12	d2v, v glimpsed		21.0	11.93	poor	18	-0.06
40	25	12	4496.85	80	12	d5v, g4v, h2v, v4B, vA	{18.0, 16.4, 15.7 {15.5, 16.0	16.3	12.49	....	24	+0.31
41	Aug. 9	10	4511.77	175	12	A3-4v, v1B	12.5, 12.5			....	...	....
42	17	11	4519.71	275	12	B1v, v4C, limit C	10.5, 8.7	11.3	13.07	good	37	+0.46
				460	40	v3B, v4-5C	14.5, 9.2			....	...	....
				175	12	v not seen, limit 6 < d or 2 < A	<17, <15	<16	<12.5	....	52	....
				275	12	d6B, B3C, Cv, limit v		4.7	13.83	good	59	+0.53

TABLE 21.—267 V ANDROMEDÆ. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
43	1898 Oct. 11	7	2410000+	80	6	v not seen, limit 4 < d....		< 19	< 12.2	fair	114	....
44	Nov. 2	7	4574.54	150	6	v1-2g, v1d, e3v.....	21.9, 24.0, 23.5 ..	23.1	11.67	good	136	+0.48
45	12	8	4596.54	150	6	v4d, v2e, n0-1v.....	27.0, 28.5, 26.7 ..	27.4	11.13	good	146	+0.36
46	19	7	4606.58	150	6	a10v, v2n, v3f.....	27.4, 29.2, 34.1 ..	30.2	10.73	good	153	+0.33
47	Dec. 3	7	4613.54	40	6	a1v, v1E'.....	36.4, 36.4.....	36.4	9.98	good	167	+0.08
48	9	6	4627.54	40	6	v3a, b3v.....	40.4, 41.6.....	41.0	9.37	good	173	-0.31
49	17	7	4633.50	40	6	v5a, b1v, v1y.....	42.4, 43.6, 43.6 ..	43.1	9.09	good	181	-0.30
50	28	6	4641.54	40	6	vy, A'3v, v5a, b4v.....	41.5, 40.9, 42.4, 39.6	41.1	9.34	good	192	-0.02
51	1899 Jan. 2	6	4652.50	40	6	v1y, A'3v, v4a, b3v.....	42.5, 40.9, 41.4, 41.6	41.6	9.30	good	197	-0.12
52	9	6	4664.50	40	6	vy, A'2v, v4a, b4v.....	41.5, 41.9, 41.4, 40.6	41.3	9.32	good	204	-0.24
53	19	7	4674.54	40	6	A'4v, b4-5v, y2v, v2a....	39.9, 40.1, 39.5, 39.4	39.7	9.54	good	214	-0.23
54	28	6	4683.50	40	6	A'6v, y4v, a1v, v6-8f....	37.9, 37.5, 36.4, 38.1	37.4	9.86	good	223	+0.09
55	Feb. 7	7	4693.54	40	6	a5v, v3-4n, v4f.....	32.4, 30.7, 35.1 ..	32.7	10.47	good	233	+0.10
56	28	8	4714.62	150	6	a7v, vn, v4-5d.....	30.4, 27.2, 27.5 ..	28.3	11.01	good	254	-0.18
57	Mar. 13	8	4727.58	150	6	v1d.....		24.0	11.57	low	9	-0.11
58	July 29	10	4865.67	150	6	f1v, v3-4n, v5e.....	30.1, 30.7, 31.5 ..	30.7	10.72	good	148	+0.04
59	Aug. 10	9	4877.63	40	6	a4v, v3f.....	33.4, 35.1.....	34.2	10.27	good	160	+0.09
60	26	9	4893.63	40	6	v6f, v1a, b4-5v.....	37.1, 38.4, 40.1 ..	38.5	9.70	good	175	+0.10
61	Sept. 11	8	4909.58	40	6	l1-2v, v1a.....	40.9, 39.4.....	40.1	9.49	....	192	+0.13
62	20	8	4918.58	150	6	va.....	37.4.....	37.5	9.83	good	200	+0.35
63	Oct. 2	8	4930.58	40	6	l3-4v, v1a.....	38.4, 37.9.....	38.6	9.70	good	212	-0.04
64	7	7	4935.54	40	6	v1a, l4v, b4-5v.....	38.4, 37.4, 40.1 ..	38.6	9.70	good	217	-0.17
65	23	7	4951.54	150	6	l2-3v, v2a, b4-5v.....	38.9, 37.4, 40.1 ..	37.9	9.80	good	233	-0.58
66	30	7	4958.60	150	6	vo-1a.....		33.2	10.40	good	240	-0.27
67	Nov. 4	7	4963.50	150	6	a5v, v4f, v5n.....	32.4, 35.1, 32.2 ..	33.3	10.39	good	245	-0.30
68	20	7	4979.54	150	6	a5v, v3n, v6e.....	32.4, 35.1, 32.5 ..	29.2	10.90	fair	3	-0.58
69	26	6	4985.50	150	6	vn, v2e, v8-10d.....	27.2, 28.5, 32.0 ..	25.4	11.38	good	9	-0.29
70	Dec. 5	6	4994.52	150	6	e4v, vn, ? v3-4d.....	22.5, 27.2, 26.5 ..	24.2	11.53	good	18	-0.45
71	19	7	5008.54	200	6	e4v, v2d, n2v.....	22.5, 25.0, 25.2 ..	20.9	11.96	good	32	-0.48
72	28	6	5017.50	150	6	d1v, v1m, g1-2v.....	22.0, 21.9, 18.9 ..	18.4	12.25	good	41	-0.49
73	1900 Jan. 2	6	5022.50	200	6	m2-3v±, limit v.....		18.2	12.28	good	46	-0.62
74	24	7	5044.54	150	6	v not seen, limit 2 < m....		< 19	< 12.2	....	68	....
75	26	6	5046.50	350	40	{ E2v, v4C, E4C, C5D } { b2g, d4m, m8B, B4E } { E3v, v3C, E2v, v6C.. } { d6m, m8-10B, B4E.. } (C4-5D, limit 6-8 < D)	7.1, 8.7.....	7.9	13.49	good	70	+0.02
76	Feb. 4	8	5055.58	350	40	v2E, vB, m10v.....	11.1, 11.5, 10.9 ..	11.1	10.13	good	98	0.00
77	22	8	5073.58	350	40	Bv, v2E, limit E.....	11.5, 11.1.....	11.4	13.05	good	100	+0.02
78	24	9	5075.63	175	12	d2v, v1m.....	21.0, 21.9.....	21.4	11.88	fair	110	-0.63
79	Mar. 7	..	5086.6	275	12	a10v, vj, v6-8e, v10d....	27.4, 31.1, 37.5, 33.0	31.2	10.67	good	124	-1.14
80	21	8	5100.58	..	12	A'1v, vy, v6a.....	42.9, 41.5, 43.4 ..	42.6	9.15	fair	185	-0.17
81	May 20	14	5160.83	40	6	b4-5v, v1a.....	40.1, 38.4.....	39.2	9.60	good	221	-0.37
82	June 25	14	5196.83	40	6	v4d, v1m, vj.....	27.0, 28.2, 31.1 ..	28.7	10.97	good	256	-0.30
83	July 30	10	5231.67	40	6	d2v, v1g.....	21.0, 21.4.....	21.2	11.90	fair	24	-0.27
84	Aug. 26	8	5258.58	150	6	d5v, v6-8B.....	18.0, 18.5.....	18.2	12.28	good	36	-0.30
85	Sept. 6	11	5269.71	237	40	v glimpsed, limit 3-4 < d.		< 19	< 12.2	good	44	....
86	15	7	5278.54	150	6	E and v glimpsed.....		9±	13.3±	poor	64	-0.1±
87	Oct. 4	15	5297.88	350	40	E1v, v1C, v4D.....	8.1, 5.7, 4.0.....	5.9	13.70	good	78	+0.21
88	18	10	5311.67	237	40	B6v, v1E, v2C.....	5.5, 10.1, 6.7.....	7.4	13.53	good	82	+0.05
89	23	6	5316.50	237	40							
90	1901 Feb. 9	9	5425.63	40	6	v1, v4-5a.....	41.4, 41.9.....	41.7	9.27	fair	192	-0.08

TABLE 21.—267 V ANDROMEDÆ. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	<i>t</i> .	<i>d</i> Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
91	1901 Nov. 1	7	2410000+ 5689.54	80	3	<i>A'1v, v_b</i>	42.9, 44.6	43.7	9.00	....	197	-0.42
92	1902 Feb. 12	..	5793.5	237	40	<i>v₀-1B</i> .....	.....	12.0	13.00	....	43	+0.19
93	23	..	5804	...	24	photograph, <i>E_{4v}, v_{4C}</i>	5.1, 8.7	6.9	13.6±	....	54	+0.43
94	Oct. 31	10	6054.67	237	40	<i>E_{1v}, v_{1C}</i>	8.1, 5.7	6.9	13.60	fair	47	+0.67
95	Dec. 26	..	6120.6	237	40	<i>E_{3v}, E_{1v}, v_{3C}</i>	8.5, 8.1, 7.7 ...	8.1	13.45	good	112	+1.03
96	1903 Oct. 11	7	6399.54	150	6	<i>v_{7d}, v_{4e}, n_{1v}</i>	30.0, 30.5, 26.2.	28.9	10.96	good	133	-0.40
97	1904 Aug. 29	..	6722	150	6	<i>a_{10v}±, v₂-3f</i>.....	.....	33.6	10.35	fair	198	+0.93
98	Sept. 11	10	6735.67	67	12	photometer.....	.....	...	10.14	good	212	+0.41
99	Oct. 6	10	6760.67	40	6	photometer.....	.....	...	10.52	fine	237	-0.02
100	Nov. 15	..	6800	...	24	photographs .....	.....	...	12.3	....	...	....
101	29	6	6814.50	40	6	<i>v</i> not seen, limit 3-4 < <i>d</i> .....	.....	<19	<12.2	fair	32	....
102	Dec. 5	7	6820.54	...	12	<i>v</i> glimpsed, <i>m_{5v}±</i>.....	.....	15.9	12.5±	good	38	-0.12
103	1905 Jan. 28	9	6874.60	237	40	photometer.....	.....	...	13.34	good	92	+0.04
104	Feb. 25	7	6902.54	237	40	<i>d_{3v}, v_{3m}</i>	20.0, 23.9	22.0	11.79	good	120	-0.20
105	Mar. 5	7	6910.54	67	12	<i>d_{2v}, e_{1v}, v_{2m}</i>	23.0, 25.5, 22.9.	23.8	11.60	good	128	-0.07
106	May 22	15	6986.88	20	5	<i>b_{4v}, v_{6a}</i>	40.6, 43.4	41.8	9.27	fair	204	-0.33
107	Aug. 6	15	7064.88	237	40	<i>d_{1v}, v_{2m}</i>	22.0, 22.9	22.4	11.75	good	24	-0.45
108	9	15	7067.88	150	6	<i>d₂-3v, v₂-3m</i>	20.5, 23.4	22.0	11.80	fair	37	-0.87
109	28	9	7086.63	150	6	<i>d₄-5v, v_m</i>	18.5, 20.9	20.1	12.03	fair	46	-0.90
110	Sept. 19	10	7108.67	237	40	<i>B_{4v}, v_{1E}, v_{3C}</i>	7.5, 10.1, 7.7 ..	8.9	13.35	fair	68	-0.13
111	Oct. 1	9	7120.63	237	40	<i>B_{1v}, v_E, v_{1C}</i>	10.5, 9.1, 5.7 ..	8.4	13.40	fair	80	-0.05
112	20	8	7139.58	80	12	<i>v</i> not seen, limit <i>B</i>.....	.....	<12	<13.0	good	...	-0.07
113	24	8	7143.58	237	40	<i>v₁-2B, v_{5C}, v_{5E}, m₆-8v</i>	13.0, 9.7, 14.1, 13.8	12.7	12.92	good	103	+0.07
114	31	9	7150.63	237	40	<i>v₂-3B, v_{6C}, m_{8v}</i>	14.0, 10.7, 12.8	13.9	12.78	good	110	+0.26
115	Dec. 23	10	7203.69	237	40	<i>v₆-8d, a₁₀-12v</i>	30.0, 26.4	29	10.9	fair	163	+0.9

TABLE 22.—267 V ANDROMEDÆ. MEAN MAGNITUDES FROM 21.5 DAY GROUPS.

Group No....	1	2	3	4	5	6	7	8	9	10	11	12
J. D.....	21.5	43	64.5	86	107.5	129	150.5	172	193.5	215	236.5	258
3944	<i>t</i>	6	....	....	....	....	....	....	187	204	226	247
	<i>M</i>	11.49	....	....	....	....	....	....	9.95	10.08	10.64	11.43
	ΔM No.	-0.07 4	....	....	....	....	....	....	+0.62 2	+0.50 4	+0.52 2	+0.52 7
4202	<i>t</i>	16	....	....	....	....	138	161	175	194	....	....
	<i>M</i>	12.46	....	....	....	....	11.02	9.89	8.81	8.7±	....	....
	ΔM No.	+0.55 2	....	....	....	....	-0.10 2	-0.24 4	-0.79 1	-0.7± 1	....	....
4460	<i>t</i>	14	30	59	....	....	141	160	182	205	228	254
	<i>M</i>	11.96	12.78	13.83	....	....	11.40	10.38	9.27	9.39	10.16	11.01
	ΔM No.	+0.12 2	+0.38 2	+0.53 1	....	....	+0.42 2	+0.20 2	-0.21 3	-0.20 3	+0.10 2	-0.18 1
4718	<i>t</i>	9	....	....	....	....	148	160	184	206	225	242
	<i>M</i>	11.57	....	....	....	....	10.72	10.27	9.60	9.76	9.75	10.50
	ΔM No.	-0.11 1	....	....	....	....	+0.04 1	+0.09 1	+0.12 2	+0.16 2	-0.38 2	-0.28 2
4976	<i>t</i>	10	36	46	75	99	117	....	185	....	221	256
	<i>M</i>	11.27	12.10	12.28	13.49	13.08	11.28	....	9.15	....	9.60	10.97
	ΔM No.	-0.44 3	-0.48 2	-0.62 1	+0.01 3	+0.01 2	-0.88 2	....	-0.17 1	....	-0.37 1	-0.30 1
5234	<i>t</i>	....	30	64	80	....	....	....	192	....	....	....
	<i>M</i>	....	12.09	13.3±	13.62	....	....	....	9.27	....	....	....
	ΔM No.	....	-0.28 2	-0.10 1	+0.13 2	....	....	....	-0.08 1	....	....	....
5492	<i>t</i>	....	....	....	....	....	....	....	....	197	....	....
	<i>M</i>	....	....	....	....	....	....	....	....	9.00	....	....
	ΔM No.	....	....	....	....	....	....	....	....	-0.42 1	....	....
5750	<i>t</i>	....	....	48	....	....	....	....	....	....	....	....
	<i>M</i>	....	....	13.3±	....	....	....	....	....	....	....	....
	ΔM No.	....	....	+0.31 2	....	....	....	....	....	....	....	....
6008	<i>t</i>	....	....	47	....	....	112	....	....	....	....	....
	<i>M</i>	....	....	13.60	....	....	13.45	....	....	....	....	....
	ΔM No.	....	....	+0.67 1	....	....	+1.03± 1	....	....	....	....	....
6266	<i>t</i>	....	....	....	....	....	133	....	....	....	....	....
	<i>M</i>	....	....	....	....	....	10.96	....	....	....	....	....
	ΔM No.	....	....	....	....	....	-0.40 1	....	....	....	....	....
6524	<i>t</i>	....	....	....	....	....	....	....	....	205	....	237
	<i>M</i>	....	....	....	....	....	....	....	....	10.24	....	10.52
	ΔM No.	....	....	....	....	....	....	....	....	+0.67 2	....	-0.02 1
6782	<i>t</i>	....	38	....	92	....	120	....	....	....	....	....
	<i>M</i>	....	12.5±	....	13.34	....	11.79	....	....	....	....	....
	ΔM No.	....	-0.12 1	....	+0.04 1	....	-0.20 1	....	....	....	....	....
Means	<i>t</i>	11	32	53	82	99	116	140	160	184	202	225
	<i>M</i>	11.75	12.37	13.26	13.48	13.08	12.17	11.02	10.18	9.34	9.53	10.04
	ΔM No.	+0.01 12	-0.13 7	+0.16 6	+0.06 6	+0.01 2	-0.02 4	-0.01 6	+0.02 7	-0.08 10	+0.03 13	-0.03 7

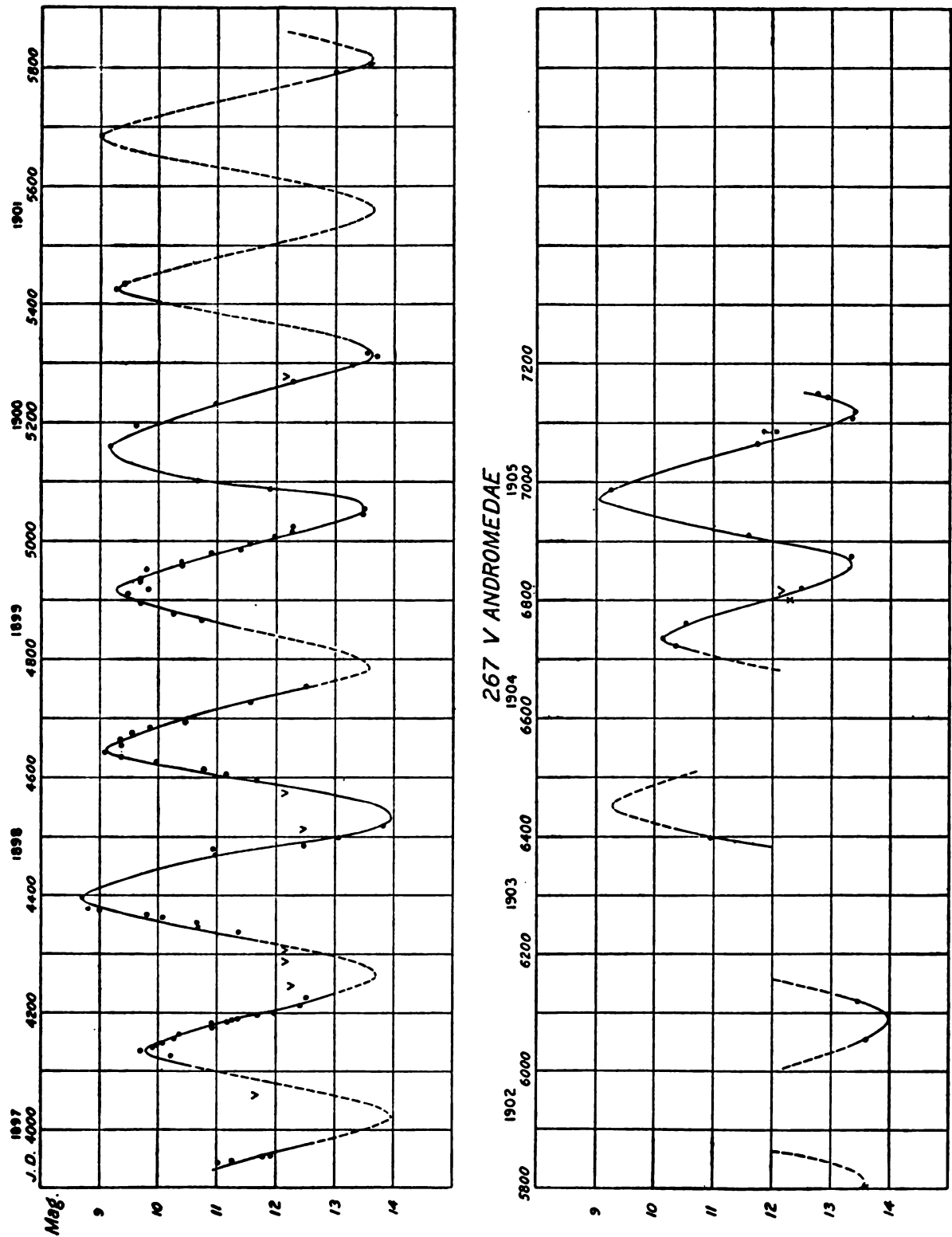


FIG. 8.—LIGHT-CURVE OF V ANDROMEDÆ.

TABLE 23.—267 V ANDROMEDÆ. OBSERVED MAXIMA AND MINIMA.
Elements of maximum. 1897 July 26 (J. D. 2414132)+259^d (E-i). $M-m=111^d$.

MAXIMA.							MINIMA.						
poch.	Date.		Mag.		Corr.	Wt.	Epoch.	Date.		Mag.		Corr.	Wt.
	Calendar.	J. D.	H.	P.				Calendar.	J. D.	H.	P.		
1	1897 July 26	4132	9.7	10.0	0	10	1	1897 Apr. 10	4025	....	mc	+ 4	3
2	1898 Apr. 15	4395	8.70	8.99	+ 4	12	2	Dec. 8	4267	....	mc	-13	4
3	Dec. 20	4644	9.10	9.39	- 6	20	3	1898 Sept. 1	4534	13.90	14.19	- 5	10
4	1899 Sept. 20	4918	9.40	9.69	+ 9	17	4	1899 May 10	4785	....	mc	-13	2
5	1900 May 17	5157	8.9	9.2	-11	8	5	1900 Feb. 5	5056	13.40	13.69	- 1	21
6	1901 Feb. 6	5422	9.3	9.6	- 5	1	6	Oct. 24	5317	13.67	13.96	+ 1	5
7	Oct. 22	5680	9.0	9.3	- 6	1	7	1901 June 24	5560	....	mc	-15	1
10	1903 Dec. 1	6450	....	mc	-13	1	8	1902 Mar. 9	5818	13.6	13.9	-16	2
11	1904 Sept. 9	6733	10.10	10.39	+11	6	9	Dec. 4	6088	14.0	14.3	- 5	3
12	1905 May 5	6971	9.06	9.35	-10	4	12	1905 Jan. 11	6857	13.32	13.61	-13	4

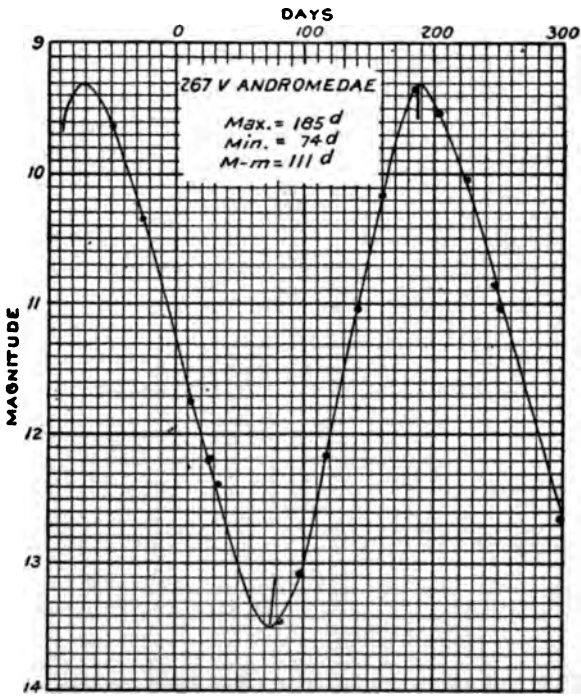


FIG. 9.—MEAN LIGHT-CURVE OF V ANDROMEDÆ.
See Table 22, page 42.

CHAPTER IV.

787 W ANDROMEDÆ.

R. A. 2^h 11^m 14^s.1; Dec. +43° 50' 26" (1900).

This is another of Anderson's discoveries, announced in the *Nachrichten* under date January 8, 1898. Observations began at once with the star on the descending branch of the light-curve. The first minimum was below the limit of the 6-inch, but the following maximum was well covered and the second minimum was observed with the 12- and 40-inch telescopes, then followed occasional observations, frequent enough to fix the number of the epoch, till the minimum and maximum of 1904 and 1905, for which more numerous observations were made. Comparing with the earlier dates the period 396 days was found and the mean light-curve deduced, using comparisons up to February 25, 1905. The subsequent maximum, 1905 May 31, indicates a slightly longer period, perhaps 397 days.

The characteristic features of the light-curve are: first, a large range, from about 7th to fainter than 13th magnitude; second, a steady variation, unbroken by secondary curves, therefore the normal points from Table 31 lie close to the mean light-curve.

The comparison star *c* has been suspected of variability by Hagen (A. N. 164, 79), and confirmatory observations are given by Williams (A. N. 164, 371). Provisional magnitudes were published by the writer in A. J. 24, 25. To give an idea of the possible variation, these are summarized below, Williams' observations being reduced to magnitudes by assuming his star *a* (my *b*) to be 9.53, and his star *b* (my *f*) to be 9.57.

Hagen.		Williams.		Parkhurst.	
Date.	Mag.	Date.	Mag.	Date.	Mag.
1900 Nov. 12	9.9	1900 Dec. 13	9.55	1899 Feb. 6	9.5
1901 Feb. 6	9.2	21	9.70	Oct. 18	9.5
10	9.2	1901 Jan. 14	9.60	23	9.4
Oct. 15	9.2	Feb. 13	9.38	28	9.3
Nov. 21	9.2	15	9.42	Nov. 4	9.2
1902 Oct. 8	8.9	1902 Jan. 31	9.68	1900 Feb. 16	9.6
1903 Sept. 22	8.8	Dec. 29	9.62	1902 Feb. 4	9.27
24	8.8	31	9.70	Mar. 4	9.14
Oct. 20	8.8			27	9.20
Nov. 18	8.9			Oct. 29	9.13
				1903 Nov. 17	9.24
				18	9.31
				19	9.26
				Dec. 6	9.23
				21	9.40
				Nov. 11	9.15
				1904 Oct. 30	9.19

With one exception, the range in either series does not exceed 0.4 magnitude, a rather slender basis to prove variability, thus throwing the burden of proof on the first observation in Hagen's series. But this is not confirmed by the nearly simultaneous observations by Williams, so that the matter is left in doubt. An idea of the color of the stars can be obtained from the following summary of visual and photographic results. The visual magnitudes are photometric, the photographic are from a Seed 27 plate and a Cramer isochromatic plate.

Star.	Vis.	Seed.	Iso.
<i>a</i>	9.15	9.12	9.13
<i>o</i>	8.93	8.95	8.95
<i>b</i>	9.53	9.53	9.53
<i>g</i>	11.05	11.05	11.05
<i>f</i>	10.12	9.58	9.70
<i>c</i>	9.28	9.80	9.66

The stars *a*, *o*, *b*, and *g*, with their visual magnitudes, were used as standards from which to obtain the photographic magnitudes of *f* and *c*. It will be noticed that the star *c* is shown to be yellow as its photographic magnitude is 0.4 to 0.5 fainter than the visual, while the star *f* is blue, photographing 0.4 or 0.5 brighter than the visual magnitude. This is confirmed by the visual observations of Hagen and the writer, compared with the photographic results of Williams.

TABLE 24.—W ANDROMEDÆ. STANDARD MAGNITUDE STARS.

Star.	B. D. No.	1900.		Color P. DM.	Magnitude.				Residuals.		
		R. A.	Dec.		Catalogue.		Measured.		From Cats.		3 Nights inter se.
					H.C.O.	P. DM.	H.	P.	H.	P.	
<i>D</i>	480	<i>h m s</i> 2 09 48	<i>° ' .</i> +42 13.9	GW—	7.61	8.14	7.73	8.14	+12	0	±7
<i>E</i>	506	2 16 31	+43 03.6	GW—	7.44	7.92	7.44	7.85	0	—7	±2
<i>r</i>	474	2 15 14	+44 08.5	GW	6.96	7.20	6.85	7.26	—11	+6	±9
Means.....		.....	.....	.....	7.34	7.75	7.34	7.75	± 8	±4	±6

TABLE 25.—COMPARISON STARS IN B. D. CATALOGUE.

Star.	B. D.		1855.		Star.	B. D.		1855.	
	No.	Mag.	R. A.	Dec.		No.	Mag.	R. A.	Dec.
	<i>°</i>		<i>h m s</i>	<i>° ' "</i>		<i>°</i>		<i>h m s</i>	<i>° ' "</i>
<i>a</i>	+43 457	8.9	2 7 18	+43 45.6	<i>r</i>	+43 474	6.5	2 12 24	+43 56.0
<i>o</i>	+43 460	9.0	2 7 51	+43 54.3	<i>p</i>	+43 478	8.0	2 12 53	+43 36.6
<i>b</i>	+43 461	9.5	2 8 21	+43 41.6	<i>q</i>	+43 482	8.2	2 14 11	+43 43.1
<i>c</i>	+43 462	9.5	2 8 37	+43 37.5					

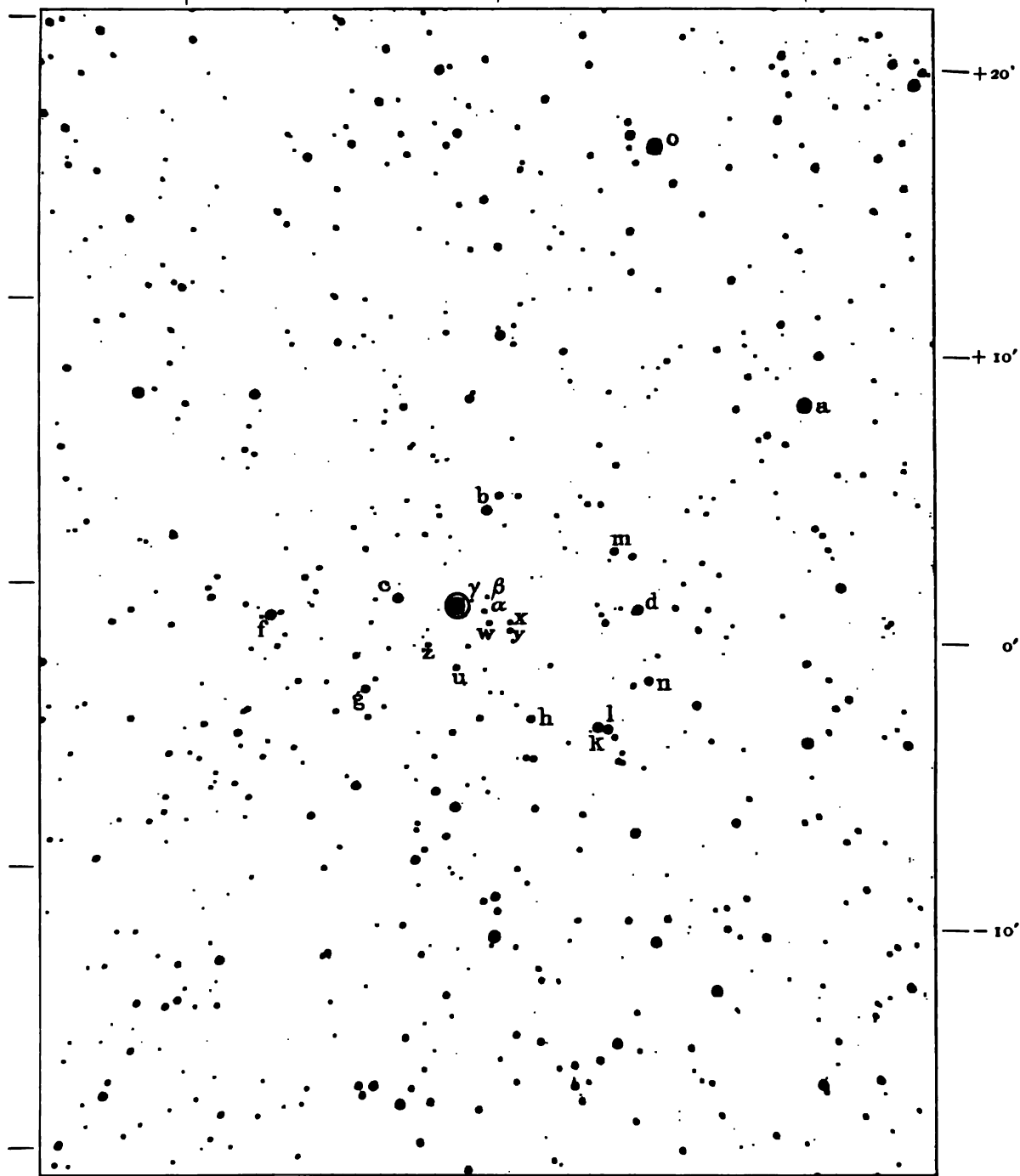
STELLAR PHOTOMETRY.

PLATE 4.

+1^m

N
0^m

-1^m



Scale, 1 mm = 13".7.

S

1902 January 12

787 W ANDROMEDAE.

R. A. 2h 11m 14s.1. Dec. +43° 50' 26", 1900

TABLE 26.—COMPARISON STARS FOR W ANDROMEDÆ (IN ORDER OF RIGHT ASCENSION).

Star.	Coordinates from Variable.			Light Scale, Steps.	Magnitude.			
	R. A.		Dec.		Measured.		From Curve.	
	H.	P.			H.	P.		
	"	s	"					
a	− 721	− 66.6	+ 468	37.8	9.15	9.56	.....	.....
n	− 421	− 38.9	− 131	21.8	.....	.....	11.09	11.50
d	− 387	− 35.8	− 15	25.8	.....	.....	10.61	11.02
o	− 366	− 33.8	+ 1007	42.0	8.93	9.34	.....	.....
l	− 341	− 31.5	− 238	.....	.....	.....	.....	.....
m	− 330	− 31.4	+ 139	19.9	.....	.....	11.21	11.62
h	− 316	− 29.2	− 235	.....	.....	.....	.....	.....
k	− 173	− 16.0	− 229	15.9	.....	.....	11.80	12.21
y	− 117	− 10.8	− 44	2.5	13.61	14.02	.....	.....
x	− 116	− 10.7	− 26	.....	.....	.....	.....	.....
w	− 71	− 6.6	− 31	.....	12.95	13.36	.....	.....
β	− 63	− 5.8	+ 22	.....	14.2	14.6	.....	.....
e	− 60	− 5.5	− 8	0	.....	.....	13.58	13.99
b	− 51	− 4.7	+ 206	34.4	9.53	9.94	.....	.....
γ	− 31	− 2.9	+ 13	.....	14.55	14.96	.....	.....
u	− 9	− 0.8	− 129	9.8	12.42	12.83	.....	.....
z	+ 59	+ 5.5	− 84	1.5	13.34	13.75	.....	.....
c	+ 130	+ 12.0	+ 9	34.7	9.28	9.69	.....	.....
g	+ 183	+ 16.9	− 188	20.2	11.05	11.46	.....	.....
f	+ 402	+ 37.1	− 43	29.3	10.12	10.53	.....	.....
r	.....	+ 240	+ 1140	54.2	6.85	7.26	.....	.....
p	.....	+ 269	− 70	46.5	7.89	8.30	.....	.....
q	.....	+ 346	+ 320	48.5	7.67	8.08	.....	.....

TABLE 27.—787 W ANDROMEDÆ. PHOTOMETER MEASURES OF COMPARISON STARS.

1903 December 6.			6-INCH.			Good; moon rising at end.		
Sidereal Time. ¹	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
h m 23 23	° 30 31	D	13.8 14.1 14.1	14.00	14.07	0.81	7.70	8.11
		E	12.3 12.0 12.2	12.17	12.17	0.52	7.41	7.82
		var	14.0 13.2 13.7	13.63	13.83	0.76	7.65	8.06
		q	14.4 13.9 14.2	14.17	.....	0.82	7.71	8.12
		p	15.2 15.3 15.8	15.43	.....	1.00	7.89	8.30
		c	25.1 26.0 25.9	25.67	26.94	2.34	9.23	9.64
		b	27.2 27.8 27.7	27.57	28.39	2.50	9.39	9.80
		a	24.2 25.7 25.8	25.23	25.58	2.20	9.09	9.50
		o	25.0 25.8 25.6	25.47	25.25	2.16	9.05	9.46
		o	25.3 24.3 25.5	25.03	.....	.....	.....	.....
		a	26.2 26.1 25.5	25.93	.....	.....	.....	.....
		b	29.0 28.8 29.8	29.20	.....	.....	.....	.....
		c	27.9 28.7 28.0	28.20	.....	.....	.....	.....
		var	14.0 14.4 13.7	14.03	.....	.....	.....	.....
		E	12.2 12.4 11.9	12.17	.....	.....	.....	.....
		D	14.3 14.1 14.0	14.13	.....	.....	.....	.....
23 52	26							

TABLE 27.—787 W ANDROMEDÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1903 December 21.			6-INCH.				Good.			
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.			
				Mean of 3.	Mean of 6.		H.	P.		
<i>h m</i> 0 38	15	<i>D</i>	12.3 12.3 11.8	12.13	12.53	0.57	7.65	8.06		
		<i>E</i>	9.8 10.4 10.0	10.07	10.57	0.35	7.43	7.84		
		<i>q</i>	12.7 13.2 13.6	13.17	12.89	0.62	7.70	8.11		
		<i>p</i>	15.3 14.8 14.4	14.83	14.73	0.90	7.98	8.39		
		<i>r_{at}</i>	11.8 12.1 11.7	11.87	12.75	0.61	7.69	8.10		
		<i>f</i>	32.3 32.7 32.4	32.47	.....	2.99	10.07	10.48	
		<i>c</i>	27.1 26.9 26.7	26.90	26.84	2.32	9.40	9.81		
		<i>v</i>	41.0 42.1 42.0	41.70	.....	4.00	11.08	11.49	
		<i>b</i>	28.1 28.0 27.8	27.97	27.85	2.44	9.52	9.93		
		<i>a</i>	24.3 24.8 24.9	24.67	24.80	2.12	9.20	9.61		
		<i>o</i>	23.2 23.7 23.9	23.60	22.92	1.91	8.99	9.40		
		<i>o</i>	21.8 22.1 22.8	22.23	.....	.....	.....	.....
		<i>a</i>	24.9 24.9 25.0	24.93	.....	.....	.....	.....
		<i>b</i>	27.3 27.9 28.0	27.73	.....	.....	.....	.....
		<i>c</i>	26.5 27.1 26.7	26.77	.....	.....	.....	.....
1 18	10	<i>r_{at}</i>	14.0 13.6 13.3	13.63	.....	.....	.....	.....
		<i>p</i>	14.2 15.2 14.5	14.63	.....	.....	.....	.....
		<i>q</i>	12.8 12.3 12.7	12.60	.....	.....	.....	.....
		<i>E</i>	11.4 10.7 11.1	11.07	.....	.....	.....	.....
		<i>D</i>	13.2 12.8 13.4	13.13	.....	.....	.....	.....
		1904 October 30. Quiet, dull.								
		22 48	37	<i>o</i>	27.1 28.0 27.3	27.60	27.99	2.56	8.91	9.32
				<i>a</i>	30.7 30.2 30.0	30.30	30.14	2.73	9.08	9.49
				<i>b</i>	32.0 32.9 33.0	32.63	32.70	3.02	9.37	9.78
				<i>c</i>	31.1 31.7 31.1	31.30	31.34	2.84	9.19	9.60
				<i>r</i>	10.8 10.1 10.2	10.37	10.75	0.36	6.71	7.12
				<i>p</i>	18.7 19.5 19.6	19.27	18.92	1.47	7.82	8.23
				<i>q</i>	16.3 17.7 17.3	17.10	16.40	1.14	7.49	7.90
				<i>E</i>	17.0 17.1 17.1	17.07	16.30	1.12	7.47	7.88
				<i>D</i>	19.1 19.6 19.9	19.53	19.03	1.48	7.83	8.24
<i>D</i>	18.2 18.4 19.0			18.53	.....	.....	.....	.....
<i>E</i>	15.1 15.7 15.8			15.53	.....	.....	.....	.....
<i>q</i>	15.0 16.2 15.9			15.70	.....	.....	.....	.....
<i>p</i>	18.1 18.5 19.1			18.57	.....	.....	.....	.....
<i>r</i>	11.0 11.3 11.1			11.13	.....	.....	.....	.....
23 17	33			<i>c</i>	30.9 31.4 31.8	31.37
		<i>b</i>	32.7 32.9 32.7	32.77	.....	.....	.....	.....
		<i>a</i>	30.0 29.7 30.2	29.97	.....	.....	.....	.....
		<i>o</i>	29.0 27.8 28.3	28.37	.....	.....	.....	.....
		1903 November 17. 12-INCH. Good.								
		23 36	28	<i>o</i>	18.4 17.3 17.7	17.80	17.94	1.44	8.88	9.29
				<i>a</i>	19.0 19.4 18.7	19.03	19.08	1.60	9.04	9.45
				<i>b</i>	23.2 24.6 24.1	23.97	23.65	2.08	9.52	9.93
				<i>c</i>	21.4 21.6 21.7	21.57	20.97	1.80	9.24	9.66
				<i>g</i>	38.1 38.6 38.0	38.23	38.23	3.57	11.01	11.42
				<i>f</i>	27.5 28.6 28.4	28.17	28.54	2.51	9.95	10.36
				<i>p</i>	10.0 10.3 10.4	10.23	10.40	0.48	7.92	8.33
				<i>q_{at}</i>	15.0 14.8 14.3	14.70	15.40	1.10	8.54	8.95
				<i>q_{at}</i>	16.7 15.7 15.9	16.10
				<i>p_{at}</i>	16.1 16.5 17.1	16.57
<i>p</i>	10.2 11.1 10.4			10.57	.....	.....	.....	.....
<i>f</i>	28.2 29.0 29.5			28.90	.....	.....	.....	.....
<i>g</i>	38.8 38.0 37.9			38.23	.....	.....	.....	.....
<i>c</i>	20.0 20.4 20.7			20.37	.....	.....	.....	.....
0 3	23			<i>b</i>	23.7 23.1 23.2	23.33
		<i>a</i>	18.9 18.8 19.7	19.13	.....	.....	.....	.....
		<i>o</i>	17.8 18.7 17.7	18.07	.....	.....	.....	.....

TABLE 27.—787 W ANDROMEDÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1903 November 18.			12-INCH.				Good.		
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.		
				Mean of 3.	Mean of 6.		H.	P.	
<i>h m</i> 22 40	37	<i>o</i>	19.9 20.9 20.0	20.27	19.52	1.65	8.96	9.37	
		<i>a</i>	22.1 22.9 22.7	22.57	21.14	1.83	9.14	9.55	
		<i>b</i>	26.5 27.2 26.9	26.87	25.75	2.26	9.57	9.98	
		<i>c</i>	22.7 23.8 23.4	23.30	22.74	2.00	9.31	9.72	
		<i>g</i>	39.7 40.7 40.0	40.13	39.87	3.75	11.06	11.47	
		<i>f</i>	31.9 32.1 32.7	32.23	31.95	2.85	10.16	10.57	
		<i>p</i>	11.0 12.1 11.2	11.43	11.10	0.56	7.87	8.28	
		<i>q</i>	9.7 9.3 9.2	9.40	9.24	0.37	7.68	8.09	
		<i>qas</i>	16.1 15.8 16.3	16.07	.....	1.21	8.52	8.93	
		<i>p</i>	10.7 11.0 10.6	10.77	.....	.....	.....	.....
		<i>f</i>	31.0 32.0 31.7	31.57	.....	.....	.....	.....
		<i>g</i>	39.2 40.0 39.6	39.60	.....	.....	.....	.....
		<i>c</i>	21.8 22.6 22.1	22.17	.....	.....	.....	.....
		<i>b</i>	24.3 24.8 24.8	24.63	.....	.....	.....	.....
		<i>a</i>	19.6 20.0 19.5	19.70	.....	.....	.....	.....
23 3	33	<i>o</i>	18.3 19.1 18.9	18.77	.....	.....	.....	.....
1903 November 19.			Very good.						
22 24	39	<i>o</i>	18.4 18.6 18.4	18.47	18.37	1.50	8.90	9.31	
		<i>a</i>	21.8 21.0 21.7	21.50	21.17	1.83	9.23	9.64	
		<i>b</i>	22.9 24.0 23.5	23.47	23.47	2.06	9.46	9.87	
		<i>c</i>	21.3 22.3 22.2	21.93	21.45	1.86	9.26	9.67	
		<i>g</i>	37.9 39.0 38.7	38.53	38.78	3.64	11.04	11.45	
		<i>f</i>	32.0 31.1 31.2	31.43	31.50	2.80	10.20	10.61	
		<i>p</i>	9.8 9.8 10.0	9.87	10.04	0.45	7.85	8.26	
		<i>qas</i>	14.0 15.0 15.0	14.67	14.74	1.02	8.42	8.83	
		<i>qas</i>	15.0 14.3 15.1	14.80	.....	.....	.....	.....
		<i>p</i>	9.3 10.3 11.0	10.20	.....	.....	.....	.....
		<i>f</i>	32.0 31.0 31.7	31.57	.....	.....	.....	.....
		<i>g</i>	39.2 38.7 39.2	39.03	.....	.....	.....	.....
		<i>c</i>	20.2 21.9 20.8	20.97	.....	.....	.....	.....
		<i>b</i>	22.9 23.9 23.6	23.47	.....	.....	.....	.....
		<i>a</i>	19.8 21.6 21.1	20.83	.....	.....	.....	.....
22 44	36	<i>o</i>	18.2 18.5 18.1	18.27	.....	.....	.....	.....
1902 November 7.			40-INCH.				Fair, uniform.		
6 20		<i>f</i>	12.1 12.7 13.6	12.80	13.60	0.86	10.12	10.53	
		<i>g</i>	21.7 22.5 24.2	22.80	22.75	2.00	11.26	11.67	
		<i>cas</i>	18.2 19.8 18.8	18.93	18.97	1.57	10.83	11.24	
		<i>bas</i>	21.2 21.4 21.8	21.47	21.84	1.91	11.17	11.58	
		<i>z</i>	40.7 41.8 41.3	41.27	41.97	3.99	13.25	13.66	
		<i>u</i>	34.8 35.7 34.3	34.93	33.92	3.06	12.32	12.73	
		<i>w</i>	39.1 38.9 38.9	38.97	39.15	3.68	12.94	13.35	
		<i>y</i>	44.0 45.6 44.0	44.53	44.77	4.30	13.56	13.97	
		<i>λ</i>	53.2 54.1 54.0	53.77	.....	5.14	14.40	14.81	
		<i>v</i>	33.8 33.2 32.9	33.30	.....	3.00	12.26	12.67	
		<i>ly</i>	44.2 45.0 45.8	45.00	.....	.....	.....	.....
		<i>w</i>	38.5 39.5 40.0	39.33	.....	.....	.....	.....
		<i>u</i>	32.2 32.8 33.7	32.90	.....	.....	.....	.....
		<i>z</i>	42.9 42.5 42.6	42.67	.....	.....	.....	.....
		<i>bas</i>	22.8 21.8 22.0	22.20	.....	.....	.....	.....
		<i>cas</i>	18.3 19.2 19.5	19.00	.....	.....	.....	.....
		<i>g</i>	23.0 22.3 22.8	22.70	.....	.....	.....	.....
		<i>f</i>	13.2 15.0 15.0	14.40	.....	.....	.....	.....

TABLE 27.—787 W ANDROMEDÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1902 December 26.			40-INCH.			Clear; somewhat unsteady.		
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
<i>h m</i> 5 50	°	<i>f</i>	15.0 15.8 17.0	15.95	16.31	1.23	10.21	10.62
		<i>g</i>	24.8 24.7 26.3	25.27	25.10	2.21	11.19	11.60
		<i>cas</i>	20.0 21.4 21.6	21.00	22.35	1.96	10.94	11.35
		<i>ba₁</i>	22.4 23.8 22.9	23.03	23.27	2.05	11.03	11.44
		<i>v</i>	20.9 20.9 21.6	21.13	.....	1.84	10.82	11.23
		<i>w</i>	42.3 41.9 41.4	41.87	.....	3.97	12.95	13.36
		<i>y</i>	46.7 47.3 47.9	47.30	.....	4.54	13.52	13.93
		<i>u</i>	37.7 38.8 38.2	38.23	.....	3.57	12.55	12.96
		<i>z</i>	46.2 46.0 45.9	46.03	.....	4.44	13.42	13.83
		<i>ba₂</i>	22.3 23.4 24.8	23.50	.....	.....	.....	.....
		<i>ca₂</i>	24.5 22.8 23.8	23.70	.....	.....	.....	.....
		<i>g</i>	24.2 24.8 25.8	24.93	.....	.....	.....	.....
		<i>f</i>	16.0 17.8 16.2	16.67	.....	.....	.....	.....
1905 January 31. Good.								
5 30		<i>f</i>	10.7 10.9 11.0	10.87	11.20	0.57	11.31	10.72
		<i>g</i>	19.1 20.6 19.7	19.80	20.06	1.72	11.46	11.87
		<i>cas</i>	5.6 6.8 7.5	6.63	6.95	0.16	9.90	10.31
		<i>ba₁</i>	9.7 9.2 8.6	9.17	10.42	0.49	10.23	10.64
		<i>v</i>	29.8 30.4 30.2	30.13	30.23	2.67	12.41	12.82
		<i>u</i>	53.5 53.9 53.4	53.60	52.16	5.00	14.74	15.15
		<i>w</i>	35.3 36.2 36.4	35.97	35.58	3.25	12.99	13.40
		<i>y</i>	41.5 43.5 42.3	42.43	42.20	4.02	13.76	14.17
		<i>u</i>	29.9 29.8 29.6	29.77	30.17	2.67	12.41	12.82
		<i>z</i>	38.0 38.2 38.5	38.23	38.75	3.63	13.37	13.78
		<i>z</i>	39.8 39.0 39.0	39.27	.....	.....	.....	.....
		<i>u</i>	30.0 30.6 31.1	30.57	.....	.....	.....	.....
		<i>y</i>	42.1 41.7 42.1	41.97	.....	.....	.....	.....
		<i>w</i>	35.2 35.3 35.1	35.20	.....	.....	.....	.....
		<i>u</i>	49.5 51.7 51.0	50.73	.....	.....	.....	.....
		<i>v</i>	29.7 31.0 30.3	30.33	.....	.....	.....	.....
		<i>ba₁</i>	11.5 10.8 12.7	11.67	.....	.....	.....	.....
		<i>ca₁</i>	6.1 7.2 8.5	7.27	.....	.....	.....	.....
		<i>g</i>	20.0 21.0 20.0	20.33	.....	.....	.....	.....
		<i>f</i>	12.1 11.2 11.3	11.53	.....	.....	.....	.....
5 50	39	<i>fas</i>	17.8 18.1 17.8	17.90	.....	.....	.....	.....

TABLE 28.—787 W ANDROMEDÆ. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

6-INCH.															
Star.	1903 December 6.					1903 December 21.					1904 October 30.				
	C.	Obs. Mag.		Δ Mag.		C.	Obs. Mag.		Δ Mag.		C.	Obs. Mag.		Δ Mag.	
		H.	P.	H.	P.		H.	P.	H.	P.		H.	P.	H.	P.
D.....	0.81	7.70	8.11	+ .09	− .03	0.57	7.65	8.06	+ .04	− .08	1.48	7.83	8.24	+ .22	+ .10
E.....	0.52	7.41	7.82	− .03	− .10	0.35	7.43	7.84	− .01	− .08	1.12	7.47	7.88	+ .03	− .04
r.....	0.01	6.90	7.31	− .06	+ .11	− 0.14	6.94	7.35	− .02	+ .15	0.36	6.71	7.12	− .25	− .08
Means..	0.45	7.34	7.75	± .06	± .08	0.26	7.34	7.75	± .02	± .10	0.99	7.34	7.75	± .17	± .07
M ₀.....	.....	6.89	7.30	.....	.....	.....	7.08	7.49	.....	.....	.....	6.35	6.76	.....	.....

12-INCH.					40-INCH.				
Star.	Mag. 6-inch.	C.			Star.	Mag. 12-inch.	C.		
		Nov. 17.	Nov. 18.	Nov. 19.			Nov. 7.	Dec. 26.	Jan. 31.
o.....	8.98	1.44	1.65	1.50	b.....	9.53	0.19	0.33	− 0.35
a.....	9.12	1.60	1.83	1.83	c.....	9.28	− 0.15	0.24	− 0.68
p.....	7.90	0.48	0.56	0.45	f.....	10.12	0.86	1.23	0.57
q.....	7.63	0.26	0.37	0.18	g.....	11.05	2.00	2.21	1.72
Mean C...	.....	0.95	1.10	1.20	Mean C...	.....	0.72	1.00	0.32
Mean Mag.	8.41	8.41	8.41	8.41	Mean Mag.	10.00	10.00	10.00	10.00
M ₀.....	.....	7.46	7.31	7.42	M ₀.....	.....	9.28	9.00	9.68

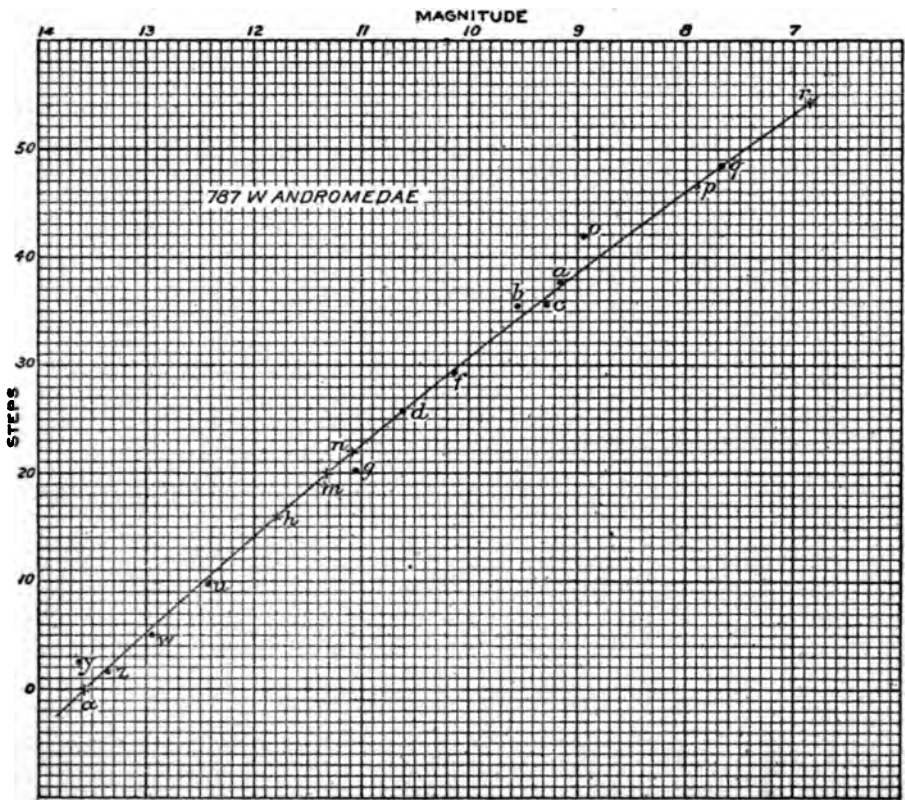


FIG 10.—MAGNITUDE CURVE FOR W ANDROMEDÆ.

TABLE 30.—787 W ANDROMEDÆ. VISUAL OBSERVATIONS OF THE VARIABLE.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day, G. M. T.					Steps.	Mag.			
	1899		2410000+									
1	Feb. 6	7	4692.54	80	6	b4-5v, c4-5v, vf, v3-4d, a5b.	29.9, 30.2, 29.3, 29.3	29.7	10.06	good	0	+0.08
2	15	7	4701.54	150	6	c4-5v, f2v, vid, v very red.	30.2, 27.3, 26.8 ..	28.1	10.31	moon	9	+0.04
3	24	7	4710.54	150	6	d3-4v, f6v, v3-4g	22.3, 23.3, 23.7 ..	23.1	10.92	fair	18	+0.31
4	28	8	4714.56	150	6	f6v, vd, v2g	23.3, 25.8, 22.2 ..	23.7	10.88	good	22	+0.18
5	Mar. 6	8	4720.56	150	6	f6-8v, d2v, v2g	22.3, 23.8, 22.2 ..	22.7	10.98	good	28	+0.03
6	13	8	4727.56	150	6	d5v, vg, v2m	20.8, 20.2, 21.9 ..	20.9	11.20	good	35	-0.01
7	18	8	4732.56	150	6	d7-8v, gv, v1m	18.3, 20.2, 20.9 ..	19.8	11.32	fair	40	-0.09
8	28	8	4742.56	150	6	g4v, m3v, v1h	16.2, 16.9, 16.9 ..	16.6	11.71	good	50	-0.04
9	Apr. 4	8	4749.56	150	6	h1-2v, limit v .....	.....	14.4	12.08	fair	57	+0.10
10	12	8	4757.56	150	6	v not seen, limit c .....	.....	<16	<11.8	fair	.....	.....
11	May 21	15	4796.88	150	6	v not seen, h glimpsed .....	.....	<16	<11.8	fair	.....	.....
12	June 10	15	4816.88	150	6	v not seen, limit i < h .....	.....	<15	<11.9	good	.....	.....
13	July 5	15	4841.88	.....	6	v not seen, limit m .....	.....	<20	<11.3	poor	.....	.....
14	29	10	4865.67	150	6	v not seen, limit 2 < h .....	.....	<14	<12.0	good	.....	.....
15	Aug. 10	9	4877.63	150	6	v not seen, limit h .....	.....	<16	<11.8	fair	.....	.....
16	30	9	4897.63	150	6	g3v, v0-1h.....	17.2, 16.4	16.8	11.70	fair	205	-0.07
17	Sept. 4	9	4902.61	150	6	v1g, v2-3h, n2v	21.2, 18.4, 19.8 ..	19.8	11.32	fair	210	-0.31
18	13	8	4911.58	150	6	v1g, v1m, m, d4-5v.....	21.2, 20.9, 21.8, 21.3	21.3	11.15	fair	219	-0.35
19	25	7	4923.54	150	6	d1-2v, v4m, v4g	24.3, 23.9, 24.2 ..	24.4	10.78	fair	231	-0.15
20	Oct. 2	8	4930.58	150	6	d1v, v4-5m, v4-5g	24.8, 24.4, 24.7 ..	24.6	10.76	good	238	+0.13
21	18	7	4946.54	80	6	b4v, c4v, v8-10d.....	30.4, 30.7, 34.8 ..	31.9	9.85	poor	254	-0.03
22	23	7	4951.54	40	6	c1v, vb, v4-5f	33.9, 34.4, 33.8 }	33.9	9.60	good	259	-0.03
23	28	7	4956.54	40	6	c1v, b0-1v, v5f	33.7, 33.9, 34.3 }	33.9	9.60	good	259	-0.03
24	Nov. 4	8	4963.56	40	6	v1c, a0-1v	35.7, 37.3	36.5	9.40	good	264	+0.10
25	15	7	4974.54	40	6	v3c, v3a, v0	37.7, 40.8, 42.0 ..	40.1	8.80	good	271	-0.09
26	26	7	4985.52	40	6	v10c, v9a, v80 ±, v2p, q1v. {	44.7, 46.8, 50.0 }	47.5	7.84	fair	282	-0.28
27	Dec. 4	7	4993.54	40	6	v3p, r6v, v2q.....	48.5, 47.5	48.5	7.66	good	293	-0.19
28	19	7	5008.54	40	6	r0-1v, v6p	49.5, 46.2, 50.5 ..	48.5	7.66	good	293	-0.19
29	23	7	5012.54	40	6	r5v, v2p	51.7, 52.5	52.1	7.16	good	301	-0.54
30	29	7	5018.54	40	6	r4v, v3-4p, v60	47.2, 48.5	47.8	7.78	good	316	+0.23
					6	r4v, v3-4p, v60	48.2, 50.0, 48.0 ..	48.7	7.76	good	320	+0.08
					6	r4-5v, v1-2p, v60	47.7, 48.0, 48.0 ..	47.9	7.77	good	326	+0.10
	1900											
31	Jan. 4	7	5024.54	40	6	v60, v2-3p, r8v	48.0, 49.0, 44.2 ..	47.0	7.89	good	332	+0.09
32	22	7	5042.54	40	6	v1p, v3-40.....	47.5, 45.5	46.5	7.95	good	350	-0.36
33	31	7	5051.52	40	6	v2p, v20,	44.5, 44.0	44.2	8.27	good	359	-0.33
34	Feb. 16	7	5067.54	40	6	05v, a2v, v2b, v3c	37.0, 35.8, 36.4, }	36.8	9.22	good	375	+0.10
35	25	8	5076.58	80	12	v2b, v3c	37.7, 36.4, 37.7 ..	36.8	9.22	good	375	+0.10
36	Mar. 9	7	5088.54	150	6	a1-2v, vb.....	36.3, 34.4	35.3	9.42	good	384	-0.04
37	22	7	5101.54	80	12	b4v, vf, v5-6d	30.4, 29.3, 31.3 ..	30.3	10.06	good	0	+0.04
38	31	8	5110.56	40	6	vf, v2-3d	29.3, 28.3	28.8	10.23	fair	13	-0.17
39	Apr. 17	9	5127.61	150	6	f4-5v, vid	24.8, 26.8	24.7	10.73	good	22	+0.03
40	May 20	14	5160.83	150	6	f5v, d1v, v3m.....	24.3, 24.8, 22.9 }	24.7	10.73	good	22	+0.03
41	28	14	5168.83	275	12	g1v, v3h.....	19.2, 18.9	19.0	11.41	low	39	+0.04
42	June 19	14	5190.83	350	40	v not seen, limit h .....	.....	<15.9	<11.8	low	.....	.....
43	July 25	15	5226.88	460	40	h8-10v, u0-1v, v2w	6.9, 9.3, 7.0	7.7	12.73	.....	80	+0.14
44	Aug. 29	15	5261.88	460	40	u2v, v1w, v2y, limit y.....	7.8, 6.0, 4.5	6.1	12.90	moon	102	+0.02
45	Oct. 4	8	5297.58	237	40	w2-3v, v1-2z, u5-6v, vy...	2.5, 3.0, 4.3 2.5 ..	3.0	13.23	fair	138	+0.30
46	25	7	5318.52	67	12	u6-8v, w1v, v4*, v2z, v1-2y {	2.8, 4.0, 4.0	3.6	13.18	.....	173	+0.70
						v2v	3.5, 4.0	3.6	13.18	.....	173	+0.70
						v4v, h2v.....	13.8, 13.9	13.8	12.02	good	230	+0.07
47	1901 Feb. 9	7	5425.54	40	6	p1-2v, v3-40.....	45.0, 45.5	45.2	8.11	fair	337	+0.17

TABLE 30.—787 W ANDROMEDÆ. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t. -	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day, G. M. T.					Steps.	Mag.			
48	1901 Nov. 1	7	2410000+ 5690.54	275	12	(<i>v</i> h, <i>v</i> 4 <i>u</i>) limit 3-4 < <i>u</i> , or 2 < <i>w</i> , or 2 < <i>x</i>	15.9, 13.8	14.8	11.92	good	206	+0.18
49	1902 Jan. 12	..	5762	...	24	photograph.....	.....	.....	.....	.....	278	....
50	Feb. 4	..	5785	237	40	<i>v</i> very bright and very red	.....	.....	7.8	.....	301	....
51	Mar. 4	..	5813	67	12	photometer.....	.....	.....	7.11	.....	329	-0.63
52	27	..	5836	67	12	photometer.....	.....	.....	7.75	.....	352	-0.61
53	Apri 2	..	5842	67	12	photometer.....	.....	.....	.....	.....	.....	.....
54	Oct. 1	9	6023.63	237	40	<i>u</i> 2-3 <i>v</i> , <i>v</i> 2-3 <i>w</i>	7.3, 7.5	7.4	12.77	poor	143	-0.13
55	Nov. 7	..	6061	237	40	photometer.....	.....	.....	12.24	.....	181	-0.10
56	Dec. 26	..	6110	237	40	photometer.....	.....	.....	10.80	.....	230	-0.15
57	1903 Oct. 11	7	6399.54	150	6	<i>v</i> not seen, limit <i>u</i>.....	.....	<10	<12.5	good	123	....
58	13	9	6401.63	80	12	<i>u</i> 1 <i>v</i> , <i>v</i> 4 <i>z</i>	8.8, 5.5	7.7	12.72	good	125	-0.27
59	Nov. 11	..	6430	67	12	photometer, also <i>u</i> 3-4 <i>v</i>.....	.....	6.3	12.88	good	154	+0.10
60	17	10	6436.67	67	12	photometer, also <i>u</i> 1 <i>v</i> , <i>v</i> 6 <i>z</i>	8.8, 7.5	8.4	12.66	good	160	-0.04
61	Dec. 6	7	6554.54	40	6	photometer, also <i>g</i> 4 <i>v</i> , <i>v</i> 1 <i>h</i>	16.2, 16.9	16.6	11.71	good	178	-0.68
62	21	7	6470.54	40	6	photometer.....	.....	.....	11.08	good	194	-0.97
63	1904 Jan. 8	7	6488.54	67	12	<i>f</i> 2-3 <i>v</i> , <i>v</i> 1-2 <i>g</i>	26.8, 21.7	24.2	10.80	good	212	-0.79
64	Aug. 29	8	6722.58	150	6	<i>g</i> 3 <i>v</i>.....	.....	17.2	11.63	fair	50	-0.12
65	Oct. 6	11	6760.71	40	6	<i>v</i> not seen, limit <i>h</i>.....	.....	<16	<11.8	fine	88	....
66	30	9	6784.63	450	40	<i>w</i> 1 <i>v</i> , <i>v</i> 3 <i>a</i>	4.0, 3.0	3.5	13.19	good	112	+0.24
67	1905 Jan. 28	9	6874.63	237	40	photometer.....	.....	.....	12.05	good	202	+0.20
68	Feb. 9	8	6886.58	275	12	<i>v</i> not seen, <i>u</i> glimpsed ..	.....	<10	<12.5	poor	214	....
69	25	8	6902.56	237	40	<i>u</i> 7, <i>v</i> 4-5 <i>u</i> , <i>v</i> 2-3 <i>h</i> , <i>h</i> 4 <i>u</i>	20.2, 14.2, 18.4 ..	18.3	11.50	good	230	+0.60
70	Mar. 3	7	6908.54	275	12	<i>g</i> 6 <i>v</i> , <i>v</i> 2 <i>h</i> , <i>c</i> 2 <i>b</i>	14.2, 17.9 .....	.....	.....	.....	.....	.....
71	24	7	6929.54	150	6	<i>w</i> , <i>x</i> , <i>y</i> and <i>z</i> seen, <i>a</i> glimpsed	.....	16.7	11.70	good	236	+1.00
72	Apr. 7	8	6943.58	40	6	<i>f</i> 4-5 <i>v</i> , <i>v</i> 2-3 <i>g</i>	24.8, 23.7	24.2	10.80	fair	257	+1.15
73	June 13	15	7010.83	20	5	<i>c</i> 1 <i>v</i> <i>v</i> 1 <i>b</i> , <i>v</i> 5 <i>f</i>	33.7, 35.4, 34.3 ..	34.5	9.51	good	271	+0.73
74	Aug. 9	15	7067.83	150	6	<i>v</i> p± .....	.....	46.5	7.95±	good	338	+0.23
75	28	9	7086.64	150	6	<i>f</i> 3-4 <i>v</i> , <i>v</i> 4 <i>g</i> , <i>c</i> 2-3 <i>b</i>	25.8, 24.2	25.0	10.71	good	0	+0.81
76	Sept. 17	8	7106.58	150	6	<i>d</i> 2-3 <i>v</i> , <i>v</i> 2 <i>g</i> , <i>f</i> 5-6 <i>v</i> , <i>c</i> 2 <i>b</i>	23.3, 22.2, 23.8 ..	23.1	10.94	fair	18	+0.34
77	Oct. 1	9	7120.63	237	40	<i>g</i> 4-5 <i>v</i> , <i>v</i> 1 <i>h</i>	15.7, 16.9	16.5	11.73	fair	38	+0.38
78	20	8	7137.54	80	12	<i>h</i> 4 <i>v</i> , <i>v</i> 4 <i>u</i>	11.9, 13.8	12.8	12.15	fair	52	+0.30
79	Dec. 23	10	7203.70	237	40	<i>h</i> 5 <i>v</i> , <i>v</i> 1-2 <i>u</i>	10.9, 11.3	11.2	12.33	good	69	0.00
80	30	9	7210.63	237	40	<i>a</i> 1 <i>v</i> , <i>v</i> 4 <i>z</i> , <i>v</i> 5 <i>γ</i>	-1.0, -2.0, -5.0	-2.2	13.81	fair	135	+0.82
						<i>z</i> 4 <i>v</i> , <i>a</i> 3 <i>v</i> , <i>v</i> 5 <i>z</i> , <i>v</i> 5 <i>γ</i>	-2.5, -3.0, -1.0, -5.0	-2.9	13.88	good	142	+0.92

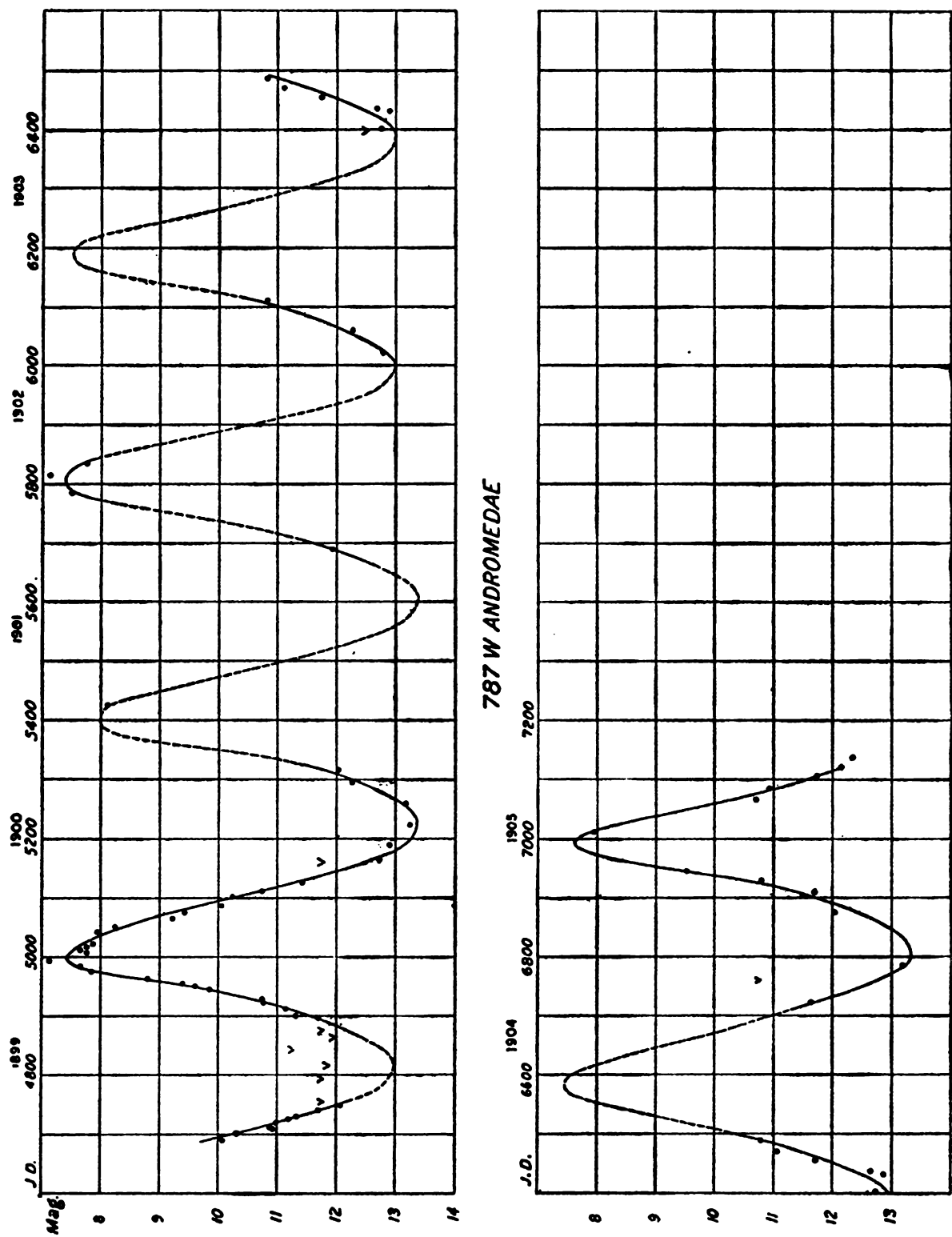


FIG. 11.—LIGHT-CURVE OF W ANDROMEDÆ.

TABLE 31.—MEAN MAGNITUDES FROM 33 DAY GROUPS.

Group No.. J. D.	1 33	2 66	3 99	4 132	5 165	6 198	7 231	8 264	9 297	10 330	11 363	12 396
4692 {	<i>t</i>	15	46	....	....	....	211	246	278	316	347	380
	<i>M</i>	10.63	11.58	....	....	....	11.39	10.25	8.42	7.9	8.04	9.32
	ΔM	+0.13	-0.01	....	....	....	-0.24	-0.02	-0.12	-0.03	-0.20	+0.03
	No.	5	4	....	....	....	3	4	4	4	3	3
5088 {	<i>t</i>	12	39	80	102	138	173	220	....	337	....	....
	<i>M</i>	10.34	11.41	12.73	12.90	13.23	13.18	12.14	....	8.11	....	....
	ΔM	-0.03	+0.04	+0.14	+0.02	+0.30	+0.70	+0.34	....	+0.17	....	....
	No.	3	1	1	1	1	1	2	....	1	....	....
5484 {	<i>t</i>	....	....	....	....	....	206	....	....	329	352	....
	<i>M</i>	....	....	....	....	....	11.92	....	....	7.11	7.75	....
	ΔM	....	....	....	....	....	+0.18	....	....	-0.63	-0.61	....
	No.	....	....	....	....	....	1	....	....	1	1	....
5880 {	<i>t</i>	....	....	....	....	143	181	230	....	....	....	....
	<i>M</i>	....	....	....	....	12.77	12.24	10.80	....	....	....	....
	ΔM	....	....	....	....	-0.13	-0.10	-0.15	....	....	....	....
	No.	....	....	....	....	1	1	1	....	....	....	....
6276 {	<i>t</i>	....	....	....	125	157	186	212	....	....	....	....
	<i>M</i>	....	....	....	12.72	12.77	11.40	10.80	....	....	....	....
	ΔM	....	....	....	-0.27	+0.03	-0.82	-0.79	....	....	....	....
	No.	....	....	....	1	2	2	1	....	....	....	....
6672 {	<i>t</i>	....	50	....	112	....	....	216	....	....	....	....
	<i>M</i>	....	11.63	....	13.19	....	....	11.78	....	....	....	....
	ΔM	....	-0.12	....	+0.24	....	....	+0.40	....	....	....	....
	No.	....	1	....	1	....	....	2	....	....	....	....
Means {	<i>t</i>	14	45	80	113	146	180	216	246	278	327	350
	<i>M</i>	10.48	11.54	12.73	12.94	12.92	12.27	11.47	10.25	8.42	7.60	7.90
	ΔM	+0.07	-0.02	+0.14	0.00	+0.06	-0.31	0.00	-0.02	-0.12	-0.10	-0.30
	No.	8	6	1	3	4	4	10	4	4	6	4

TABLE 32.—787 W ANDROMEDÆ. OBSERVED MAXIMA AND MINIMA.

Elements of maximum. 1899 Dec. 16 (J. D. 2415005)+396¹ E. *M* - *m*=192⁴.

MAXIMA.							MINIMA.						
Epoch.	Date.		Mag.		Corr.	Wt.	Epoch.	Date.		Mag.		Corr.	Wt.
	Calendar.	J. D.	H.	P.				Calendar.	J. D.	H.	P.		
0	1899 Dec. 7	4996	7.42	7.83	- 9	27	0	1899 June 16	4819	13.0	13.4	+ 6	20
1	1901 Jan. 15	5400	....	mc	- 1	1	1	1900 July 23	5224	13.36	13.77	+15	9
2	1902 Feb. 28	5809	7.4	7.8	+12	4	2	1901 Aug. 13	5610	....	mc	+ 5	1
3	1903 Mar. 16	6190	....	mc	- 3	1	3	1902 Aug. 31	5993	13.0	13.4	- 8	2
4	1904 Apr. 17	6588	....	mc	- 1	1	4	1903 Sept. 25	6383	13.0	13.4	-14	5
							5	1904 Nov. 15	6800	13.34	13.75	+ 7	6

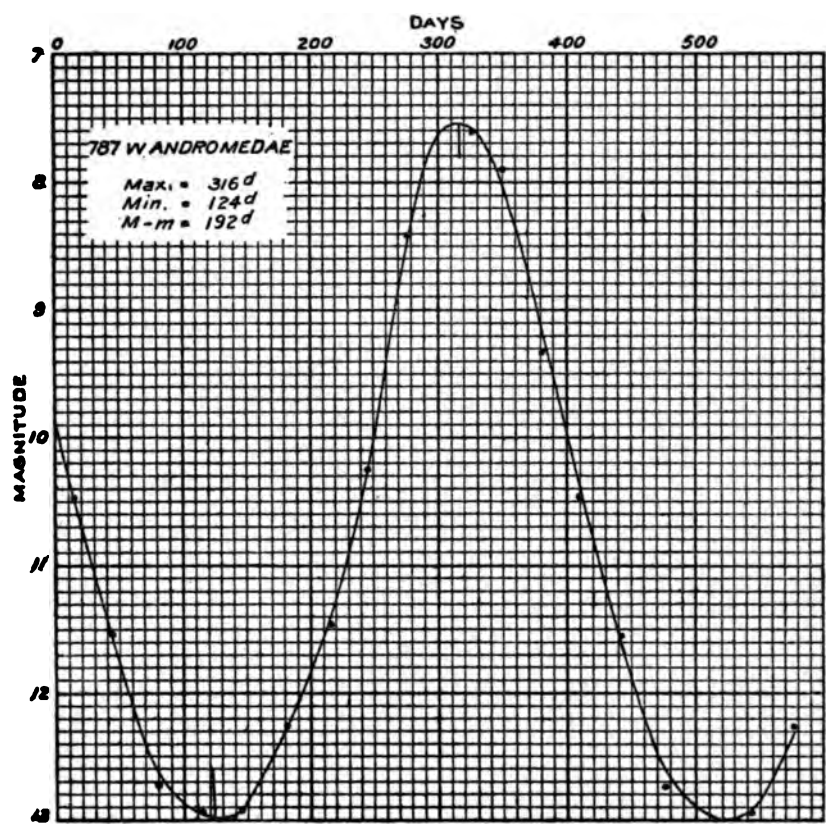


FIG. 12.—MEAN LIGHT-CURVE OF W ANDROMEDÆ.

CHAPTER V.

4315 R COMÆ.

R. A. 11h 59m 8.4s; Dec. + 19° 20' 19" (1900).

Discovered by Schönfeld in 1856, this might almost be called a historic star, but the published observations were so fragmentary in character that more work was needed. The period was found to be only a few days less than a year, and the maximum so near conjunction with the sun that comparisons were uncertain in the twilight, while the beginning of the descending branch of the light curve was lost in the daylight, and it appears that no one had followed it in the morning sky, or continued observations through the minimum. The present observations, when combined into the mean curve, figure 15, cover the entire period, and seem to show that the time of maximum is about 20 days later than that found from evening observations alone. The maxima numbered 40, 41, 42, 44, and 48 are well covered with observations on both branches of the curve, but the twilight renders it difficult to fix the exact magnitude at maximum; it can only be stated as about 8.5, with the evidence insufficient to say whether it changes from one maximum to another. The minima, on the contrary, can be well followed, the three best observed, numbers 44, 46, and 49, giving a magnitude a few tenths brighter than 14.

The faint stars with the Greek letters, α , and the variable were connected with the bright star F (B. D. + 19° 2526) in February and March, 1900, with the micrometer on the 40-inch. The place of the variable given above results from the Berlin A. G. Catalogue position of the star F .

4315 R COMÆ.

TABLE 33.—STANDARD MAGNITUDE STARS.

Star.	B. D. No.	1900.		Color P. DM.	Magnitude.				Residuals.		
		R. A.	Dec.		Catalogue.		Measured.		From Cats.		3 Nights inter se.
					H.C.O.	P.DM.	H.	P.	H.	P.	
<i>A</i>	°	<i>h m s</i>	° '								
<i>B</i>	+18 2539	11 49 00	+18 43.4	WG	7.76	8.16	7.89	8.19	+13	+ 3	± 6
<i>F</i>	+18 2546	11 52 35	+18 01.6	GW	6.91	7.04	6.81	7.11	-10	+ 7	± 7
	+19 2526	11 58 57	+19 23.1	G—	7.64	8.02	7.62	7.92	- 2	-10	± 4
	Mean ...	.....	.....	.....	7.44	7.74	7.44	7.74	± 8	± 7	± 6

TABLE 34.—4315 R COMÆ. COMPARISON STARS IN B. D. CATALOGUE.

Star.	B. D.		1855.		Star.	B. D.		1855.	
	No.	Mag.	R. A.	Dec.		No.	Mag.	R. A.	Dec.
	°		<i>h m s</i>	° ' "		°		<i>h m s</i>	° ' "
<i>U</i>	+19 2522	9.1	11 54 2	+19 59.1	<i>1U</i>	+19 2525	9.1	11 55 15	+19 38.3
<i>a</i>	+20 2670	8.6	11 54 58	+20 5.5	<i>P</i>	+20 2676	8.4	11 56 25	+20 11.8
<i>R</i>	+19 2524	8.8	11 55 9	+19 20.4	<i>H</i>	+20 2683	7.8	11 59 59	+20 10.1

TABLE 35.—COMPARISON STARS FOR R COMÆ.

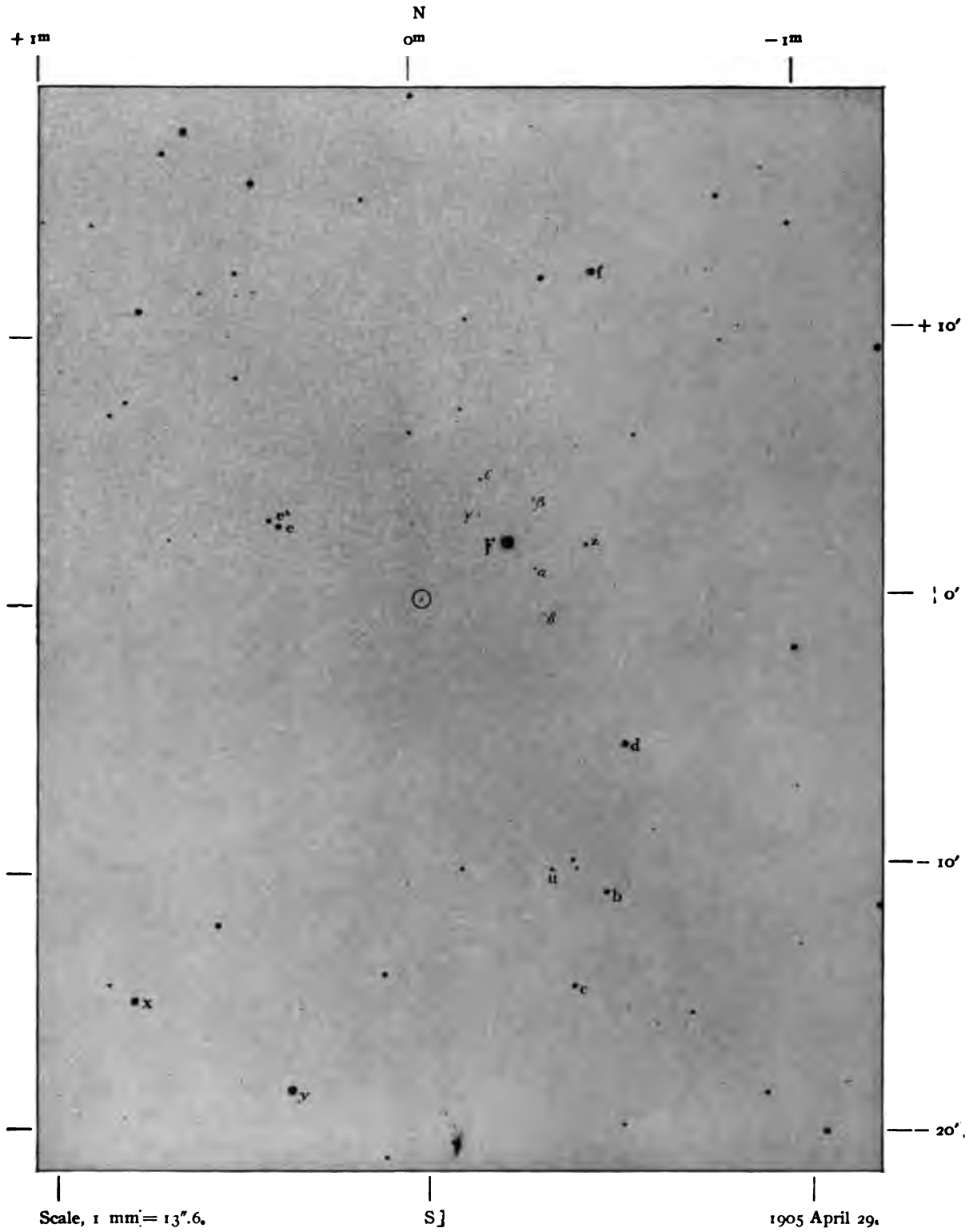
Star.	Coordinates from Variable.			Light Scale, Steps.	Magnitude.			
	R. A.		Dec.		Measured.		From Curve.	
					H.	P.	H.	P.
	"	"	"					
<i>U</i>	—2390	—168.8	+1454	....	9.77	10.07	.....	.....
<i>a</i>	—1589	—112.3	+1772	40.9	9.09	9.39	.....	.....
<i>R</i>	—1454	—102.4	—900	39.0	9.15	9.45	.....	.....
<i>1U</i>	—1328	—93.9	+289	32.6	10.14	10.44	.....	.....
<i>d</i>	—453	—32.0	—329	25.4	10.67	10.97	.....	.....
<i>b</i>	—408	—28.8	—658	17.1	12.29	12.59	.....	.....
<i>f</i>	—404	—28.5	+735	26.4	10.57	10.87	.....	.....
<i>c</i>	—336	—23.7	—869	18.6	12.43	12.73	.....	.....
<i>z</i>	—379	—26.8	+124	11.3	12.83	13.13	.....	.....
<i>P</i>	—359	—25.4	+2160	44.2	.....	.....	8.57	8.87
<i>u</i>	—289	—20.4	—609	....	12.81	13.11	.....	.....
<i>s</i>	—281	—19.9	—34	0	14.70	15.00	.....	.....
<i>a</i>	—263	—18.6	+71	3.0	14.08	14.38	.....	.....
<i>ß</i>	—259	—18.3	+226	4.0	14.08	14.38	.....	.....
<i>F</i>	—199	—14.1	+130	52.9	7.62	7.92	.....	.....
<i>e</i>	—138	—9.7	+273	9.0	13.19	13.49	.....	.....
<i>γ</i>	—136	—9.6	+194	4.0	14.17	14.47	.....	.....
<i>e</i> ²	+327	+23.1	+171	21.3	.....	.....	11.47	11.77
<i>e</i> ³	+352	+24.9	+185	16.3	.....	.....	12.16	12.46
<i>H</i>	....	+190	+2058	49.2	.....	.....	7.98	8.28

TABLE 36.—4315 R COMÆ. PHOTOMETER MEASURES OF COMPARISON STARS.

1904 July 4.			6-INCH.				Fair.	
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
<i>h m</i>	°	<i>v</i>	26.8 26.8 27.9	27.17	27.84	2.44	9.59	9.89
16 14		<i>R</i>	27.9 28.6 28.7	28.40	27.60	2.41	9.56	9.86
	59	<i>a</i>	25.4 24.8 24.9	25.03	23.65	2.01	9.16	9.46
		<i>U</i>	27.2 27.1 28.2	27.50	27.12	2.36	9.51	9.81
	60—	<i>D_{a1}</i>	14.0 13.9 13.8	13.90	14.27	0.83	7.98	8.28
		<i>1U</i>	31.4 32.4 31.9	31.90	32.57	3.00	10.15	10.45
		<i>F</i>	10.9 10.4 10.7	10.67	11.19	0.42	7.57	7.87
		<i>B_{a1}</i>	9.8 10.1 11.1	10.33	10.98	0.38	7.53	7.83
	63	<i>A</i>	14.1 14.7 14.3	14.37	14.29	0.83	7.98	8.28
		<i>A</i>	14.2 14.0 14.4	14.20	.....	.....	.....	.....
	63+	<i>B_{a1}</i>	11.9 11.1 11.9	11.63	.....	.....	.....	.....
	62—	<i>F</i>	12.0 11.2 11.9	11.70	.....	.....	.....	.....
	62+	<i>1U</i>	33.8 32.9 33.0	33.23	.....	.....	.....	.....
	63	<i>D_{a1}</i>	15.0 14.2 14.7	14.63	.....	.....	.....	.....
	63	<i>U</i>	26.4 26.9 26.9	26.73	.....	.....	.....	.....
	63	<i>a</i>	22.2 22.3 22.3	22.27	.....	.....	.....	.....
	63	<i>R</i>	26.8 26.7 26.9	26.80	.....	.....	.....	.....
16 40	64	<i>v</i>	27.8 29.4 28.3	28.50	.....	.....	.....	.....

STELLAR PHOTOMETRY.

PLATE 5.



4315 R COMÆ.
R. A. 11h 59m 8s.4. Dec. +19° 20' 19".1900.

TABLE 36.—4315 R COME. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1904 July 9.			6-INCH.				Good.		
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.		
				Mean of 3.	Mean of 6.		H.	P.	
h^m	$^{\circ}$								
15 54	57	A	13.7 14.4 14.1	14.07	14.90	0.92	7.79	8.09	
	57	B ₆₁	13.2 13.1 13.1	13.13	14.02	0.80	7.67	7.97	
	56	R ₆₁	33.3 33.5 34.0	33.60	.....	3.14	10.01	10.31
		R	27.8 27.2 28.0	27.67	27.64	2.41	9.28	9.58	
	57-	iU	35.1 35.0 34.9	35.00	34.27	3.18	10.05	10.35	
	57-	F	14.1 13.5 13.3	13.63	13.72	0.75	7.62	7.92	
		v	27.3 28.2 27.7	27.73	.....	2.42	9.29	9.59
	57	a	24.5 24.9 25.1	24.83	24.77	2.11	8.98	9.28	
	58-	U	31.4 31.9 31.2	31.50	30.90	2.79	9.66	9.96	
	58	D ₆₁	14.0 14.3 14.0	14.10	14.27	0.83	7.70	8.00	
		D ₆₁	14.0 14.5 14.8	14.43	.....	.....	.....	.....
	58	U	29.9 30.3 30.7	30.30	.....	.....	.....	.....
	58	a	24.3 24.8 25.0	24.70	.....	.....	.....	.....
	59	F	12.7 14.8 13.9	13.80	.....	.....	.....	.....
	60	iU	33.2 33.4 34.0	33.53	.....	.....	.....	.....
	60-	R	26.8 28.2 27.8	27.60	.....	.....	.....	.....
	62-	B ₆₁	14.9 14.9 14.9	14.90	.....	.....	.....	.....
16 18	62	A	15.6 15.7 16.0	15.73	.....	.....	.....	.....
1905 January 13.									
Good.									
12 24		D	9.1 9.2 10.0	9.43	10.25	0.32	6.88	7.18	
		U	31.3 32.1 31.7	31.70	32.74	3.02	9.58	9.88	
		a	28.1 28.7 29.5	28.77	29.40	2.62	9.18	9.48	
		iU	36.8 36.1 36.7	36.53	36.78	3.55	10.11	10.41	
		F	15.7 16.1 15.6	15.80	16.26	1.12	7.68	7.98	
		d	48.2 47.2 47.9	47.77	48.24	4.57	11.13	11.43	
		R	30.3 30.3 30.3	30.30	29.78	2.66	9.22	9.52	
		B	8.9 8.8 8.4	8.70	8.80	0.18	6.74	7.04	
		A	17.5 18.1 18.1	17.90	17.86	1.33	7.89	8.19	
		A	17.7 17.7 18.1	17.83	.....	.....	.....	.....
		B	8.8 9.1 8.8	8.90	.....	.....	.....	.....
		R	28.7 29.7 29.4	29.27	.....	.....	.....	.....
		d	48.7 48.6 48.8	48.70	.....	.....	.....	.....
		F	17.1 16.1 17.0	16.73	.....	.....	.....	.....
		iU	36.3 37.7 37.1	37.03	.....	.....	.....	.....
		a	29.2 30.3 30.6	30.03	.....	.....	.....	.....
		U	33.8 34.3 33.2	33.77	.....	.....	.....	.....
13 5		D	10.5 11.5 11.2	11.07	.....	.....	.....	.....
1905 February 3.									
12-INCH.									
Good, -4°F.									
14 0	34	R	13.0 13.5 14.0	13.50	15.12	1.07	9.10	9.40	
		iU	23.6 24.6 23.9	24.03	24.52	2.16	10.19	10.49	
		c	46.5 46.5 46.3	46.43	45.28	4.36	12.39	12.69	
		b	42.8 44.2 43.0	43.33	43.28	4.13	12.16	12.46	
		d	31.0 31.9 31.3	31.40	29.72	2.62	10.65	10.95	
		F ₆₁	8.4 8.7 8.4	8.50	8.76	0.31	8.34	8.64	
		f	26.7 27.0 26.9	26.87	27.72	2.43	10.46	10.76	
		a	15.5 15.7 15.4	15.53	14.78	1.02	9.05	9.35	
		U	21.8 21.7 20.8	21.43	20.62	1.77	9.80	10.10	
		U	19.3 19.9 20.2	19.80	.....	.....	.....	.....
		a	13.8 13.9 14.4	14.03	.....	.....	.....	.....
		P	11.3 11.8 11.8	11.63	0.62	.....	8.65	8.95
		f	27.7 29.4 28.6	28.57	.....	.....	.....	.....
		F ₆₁	8.9 9.9 8.3	9.03	.....	.....	.....	.....
		d	27.8 28.2 28.9	28.03	.....	.....	.....	.....
		b	43.1 43.9 42.3	43.23	.....	.....	.....	.....
		c	44.0 44.6 43.8	44.13	.....	.....	.....	.....
		iU'	25.0 25.2 24.8	25.00	.....	.....	.....	.....
14 43	45	R	17.0 16.1 17.1	16.73	.....	.....	.....	.....

TABLE 36.—4315 R COMÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1905 February 27.			12-INCH.				Good, a little unsteady.	
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
<i>h m</i> 8 25	°	<i>R</i>	18.3 19.0 19.1	18.80	18.62	1.55	9.29	9.59
		<i>iU</i>	27.7 28.3 27.5	27.83	27.15	2.38	10.12	10.42
		<i>d</i>	33.4 33.6 32.9	33.30	32.66	2.93	10.67	10.97
		<i>c</i>	48.9 47.8 48.7	48.47	48.72	4.68	12.42	12.72
		<i>b</i>	45.0 46.7 46.2	45.97	46.70	4.50	12.24	12.54
		<i>F_{a1}</i>	12.2 12.4 12.3	12.30	12.55	0.75	8.49	8.79
		<i>f</i>	32.1 32.4 33.2	32.57	32.34	2.89	10.63	10.93
		<i>a</i>	15.6 16.9 16.0	16.17	16.54	1.26	9.00	9.30
		<i>U</i>	22.0 22.8 23.0	22.60	22.75	2.00	9.74	10.04
		<i>U</i>	23.0 22.6 23.1	22.90	.....	.....	.....	.....
		<i>a</i>	16.7 16.9 17.0	16.87	.....	.....	.....	.....
		<i>f</i>	31.0 33.2 32.1	32.10	.....	.....	.....	.....
		<i>F_{a1}</i>	12.8 13.3 12.3	12.80	.....	.....	.....	.....
		<i>b</i>	47.8 47.6 46.9	47.43	.....	.....	.....	.....
		<i>c</i>	49.0 48.8 49.1	48.97	.....	.....	.....	.....
		<i>d</i>	32.0 32.0 32.1	32.03	.....	.....	.....	.....
		<i>iU</i>	26.0 27.1 26.3	26.47	.....	.....	.....	.....
		<i>R</i>	18.5 18.7 18.1	18.43	.....	.....	.....	.....
8 50								
1905 March 3.			Good.					
9 45		<i>R</i>	13.7 13.4 13.4	13.50	15.26	1.09	9.07	9.37
		<i>iU</i>	23.3 23.0 22.8	23.03	24.33	2.14	10.12	10.43
		<i>c</i>	46.9 46.1 45.8	46.27	46.74	4.50	12.48	12.78
		<i>b</i>	45.5 45.0 45.6	45.37	46.58	4.49	12.47	12.77
		<i>d</i>	29.4 30.0 29.8	29.73	30.52	2.71	10.69	10.99
		<i>F_{a1}</i>	9.7 8.9 8.9	9.17	9.44	0.37	8.35	8.65
		<i>f</i>	29.5 28.8 29.2	29.17	29.90	2.65	10.63	10.93
		<i>a</i>	15.9 16.3 15.9	16.03	16.25	1.23	9.21	9.51
		<i>U</i>	20.0 21.1 20.1	20.73	20.76	1.79	9.77	10.07
		<i>U</i>	20.5 21.2 20.7	20.80	.....	.....	.....	.....
		<i>a</i>	16.0 16.8 16.6	16.47	.....	.....	.....	.....
		<i>f</i>	31.0 29.9 31.0	30.63	.....	.....	.....	.....
		<i>F_{a1}</i>	10.1 8.9 10.1	9.70	.....	.....	.....	.....
		<i>d</i>	31.0 31.8 31.1	31.30	.....	.....	.....	.....
		<i>b</i>	47.7 48.4 47.3	47.80	.....	.....	.....	.....
		<i>c</i>	47.2 46.7 47.7	47.20	.....	.....	.....	.....
		<i>iU</i>	25.0 26.2 25.7	25.63	.....	.....	.....	.....
		<i>R</i>	16.9 17.3 16.9	17.03	.....	.....	.....	.....
10 24	41							
1905 March 5.			40-INCH.				Quite good.	
15 0		<i>c</i>	26.5 27.7 25.8	26.67	26.64	2.35	12.05	12.35
		<i>b</i>	25.7 26.4 26.3	26.13	27.22	2.38	12.08	12.38
		<i>d</i>	16.3 17.2 16.1	16.53	16.46	1.25	10.95	11.25
		<i>δ</i>	52.8 54.3 53.0	53.37	52.50	5.03	14.73	15.03
		<i>α</i>	48.5 47.7 48.6	48.27	46.95	4.47	14.17	14.47
		<i>z</i>	34.8 34.2 34.0	34.33	33.72	3.05	12.75	13.05
		<i>β</i>	42.1 43.3 43.2	42.87	44.00	4.22	13.92	14.22
		<i>ε</i>	36.7 36.3 37.2	36.73	37.85	3.53	13.23	13.53
		<i>γ</i>	48.3 49.0 47.8	48.37	46.47	4.46	14.16	14.46
		<i>ν</i>	44.0 44.0 44.6	44.20	43.78	4.18	13.88	14.18
		<i>f</i>	15.8 16.2 16.5	16.17	16.00	1.19	10.89	11.19
		<i>f</i>	15.0 16.2 16.3	15.83	.....	.....	.....	.....
		<i>ν</i>	43.1 43.0 44.0	43.37	.....	.....	.....	.....
		<i>γ</i>	46.2 44.8 45.7	45.57	.....	.....	.....	.....
		<i>ε</i>	37.2 38.6 38.1	37.97	.....	.....	.....	.....
		<i>β</i>	44.1 45.2 46.1	45.13	.....	.....	.....	.....
		<i>z</i>	32.2 33.8 33.3	33.10	.....	.....	.....	.....
		<i>α</i>	45.1 46.0 45.8	45.63	.....	.....	.....	.....
		<i>δ</i>	52.0 51.7 51.3	51.63	.....	.....	.....	.....
		<i>d</i>	15.5 16.9 16.8	16.40	.....	.....	.....	.....
15 30		<i>b</i>	28.1 28.1 28.7	28.30	.....	.....	.....	.....
		<i>c</i>	26.5 26.7 26.6	26.60	.....	.....	.....	.....
		<i>α</i>	33.9 34.7 34.0	34.20	3.11	.....	12.81	13.11

TABLE 36.—4315 R COMÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1905 April 1.		40-INCH				Fair to good, settings good.		
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
h m 8 56	°	c	26.4 27.2 26.3	26.63	24.98	2.20	12.26	12.56
		b	23.8 24.1 24.7	24.20	22.75	2.00	12.06	12.36
		u	31.2 32.3 31.4	31.63	31.03	2.76	12.82	13.12
		d	14.1 12.4 13.2	13.23	13.85	0.89	10.95	11.25
		s	49.0 51.2 51.3	50.50	48.04	4.62	14.68	14.98
		a	42.3 43.8 43.3	43.13	41.20	3.91	13.97	14.27
		x	34.5 33.0 33.2	33.57	33.08	2.98	13.04	13.34
		v	38.8 41.1 40.0	39.97	39.28	3.70	13.76	14.06
		y	45.7 44.1 44.6	44.80	45.44	4.37	14.43	14.73
		e	36.3 36.4 36.9	36.53	36.03	3.32	13.38	13.68
		β	45.5 46.4 45.7	45.87	45.25	4.36	14.42	14.72
		f	10.0 12.6 11.7	11.43	11.65	0.62	10.68	10.98
		j	11.4 11.1 13.1	11.87	.....	.....	.....	.....
		β	44.0 45.1 44.8	44.63	.....	.....	.....	.....
		e	35.0 35.9 35.7	35.53	.....	.....	.....	.....
		γ	45.2 47.0 46.0	46.07	.....	.....	.....	.....
		v	39.2 37.8 38.8	38.60	.....	.....	.....	.....
		x	32.0 32.4 33.4	32.60	.....	.....	.....	.....
		a	40.8 38.1 38.9	39.27	.....	.....	.....	.....
		s	43.9 48.3 44.5	45.57	.....	.....	.....	.....
		d	14.2 15.0 14.2	14.47	.....	.....	.....	.....
		u	29.3 31.0 31.0	30.43	.....	.....	.....	.....
		b	18.8 23.0 22.1	21.30	.....	.....	.....	.....
		c	23.7 22.9 23.1	23.23	.....	.....	.....	.....
0 27								
1905 April 4.		Good.						
14 26		c	32.2 31.5 31.9	31.87	31.52	2.81	12.28	12.58
		b	31.9 32.1 31.9	31.97	31.07	2.76	12.23	12.53
		u	38.1 37.7 36.7	37.50	36.28	3.34	12.81	13.11
		d	16.2 17.3 16.8	16.73	17.20	1.35	10.82	11.12
		s	54.0 53.7 54.3	54.00	54.86	5.21	14.68	14.98
		a	47.5 48.9 48.3	48.23	48.03	4.62	14.09	14.39
		x	35.7 36.1 35.3	35.70	35.34	3.22	12.69	12.99
		v	40.7 40.4 40.9	40.67	41.62	3.95	13.42	13.72
		y	46.1 47.3 45.8	46.40	46.24	4.45	13.92	14.22
		e	37.3 38.6 38.7	38.20	37.68	3.50	12.97	13.27
		β	47.0 47.8 44.4	46.33	45.96	4.42	13.89	14.19
		f	16.0 15.2 15.9	15.70	15.78	1.16	10.63	10.93
		j	15.8 16.1 15.7	15.87	.....	.....	.....	.....
		β	45.1 44.8 46.9	45.60	.....	.....	.....	.....
		e	37.0 37.8 36.7	37.17	.....	.....	.....	.....
		γ	44.6 47.5 46.3	46.07	.....	.....	.....	.....
		v	42.9 42.7 42.1	42.57	.....	.....	.....	.....
		x	35.0 34.9 35.0	34.97	.....	.....	.....	.....
		a	47.7 47.4 48.4	47.83	.....	.....	.....	.....
		s	55.2 57.0 55.0	55.73	.....	.....	.....	.....
		d	18.2 17.3 17.5	17.67	.....	.....	.....	.....
		u	34.0 35.0 36.2	35.07	.....	.....	.....	.....
		b	30.0 30.7 29.8	30.17	.....	.....	.....	.....
		c	30.7 31.7 31.1	31.17	.....	.....	.....	.....
15 02	45							

TABLE 37.—4315 R COMÆ. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

6-INCH.															
Star.	1904 July 4.					1904 July 9.					1905 January 12.				
	C.	Obs. Mag.		J Mag.		C.	Obs. Mag.		J Mag.		C.	Obs. Mag.		J Mag.	
		H.	P.	H.	P.		H.	P.	H.	P.		H.	P.		
A....	0.83	7.98	8.28	+ .22	+ .12	0.92	7.79	8.09	+ .03	− .07	1.33	7.89	8.19	+ .13	+ .03
B....	− 0.37	6.78	7.08	− .13	+ .04	0.05	6.92	7.22	+ .01	+ .18	0.18	6.74	7.04	− .17	.00
F....	0.42	7.57	7.87	− .07	− .15	0.75	7.62	7.92	− .02	− .10	1.12	7.68	7.98	+ .04	− .04
Means..	0.29	7.44	7.74	± .14	± .10	0.57	7.44	7.74	± .02	± .12	0.88	7.44	7.74	± .11	± .02
M ₀....	....	7.15	7.45	....	....	....	6.87	7.17	....	....	....	6.56	6.86	....	....

12-INCH.					40-INCH.				
Star.	Mag. 6-inch.	C.			Star.	Mag. 12-inch.	C.		
		Feb. 3.	Feb. 27.	Mar. 3.			Mar. 5.	Apr. 1.	Apr. 4.
a.....	9.11	1.02	1.26	1.23	b.....	12.29	2.38	2.00	2.76
R.....	9.35	1.07	1.55	1.09	c.....	12.43	2.35	2.20	2.81
U.....	9.58	1.77	2.00	1.79	d.....	10.67	1.25	0.89	1.35
1U.....	10.10	2.16	2.38	2.14	f.....	10.57	1.19	0.62	1.16
Mean C....	....	1.51	1.80	1.56	Mean C....	....	1.79	1.43	2.02
Mean Mag.	9.54	9.54	9.54	9.54	Mean Mag..	11.49	11.49	11.49	11.49
M ₀.....	....	8.03	7.74	7.98	M ₀.....	....	9.70	10.06	9.47

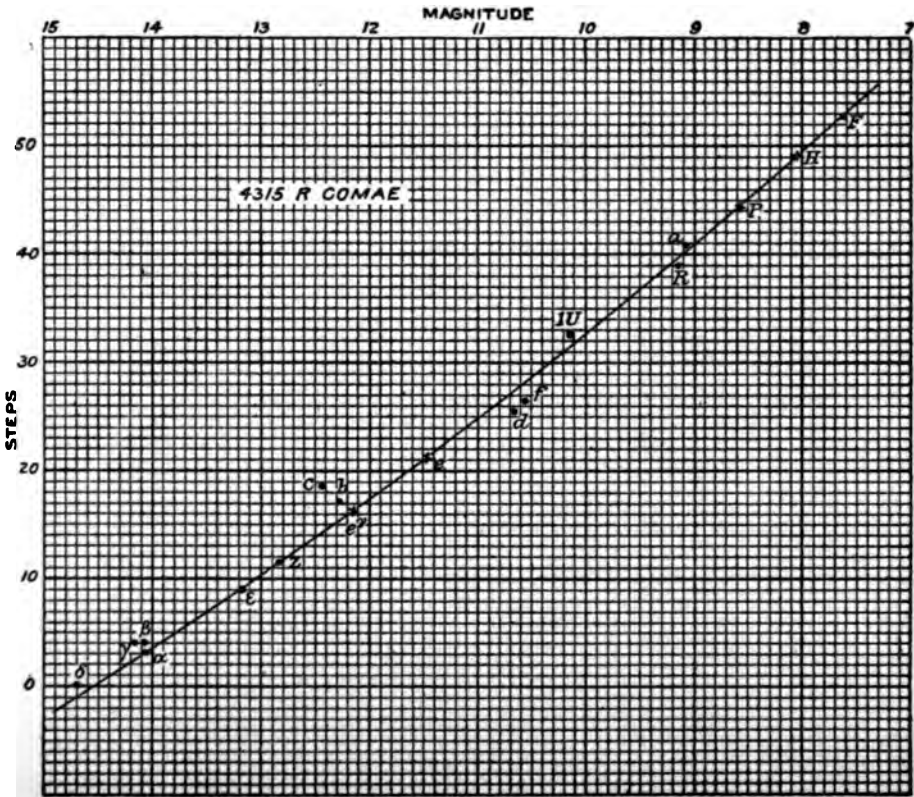


FIG. 13.—MAGNITUDE-CURVE FOR R COMÆ.

TABLE 38.—4315 R COMÆ. MEAN MAGNITUDES.

6-INCH.									
Star.	July 4.		July 9.		January 12.		Mean.		
	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag. H.	Mag. P.	Δ Mag.
A	7.98	+0.09	7.79	−0.10	7.89	0.00	7.89	8.19	±0.06
B	6.78	−0.03	6.92	+0.11	6.74	−0.07	6.81	7.11	±0.07
F	7.57	−0.05	7.62	0.00	7.68	+0.06	7.62	7.92	±0.04
Mean							7.44	7.74	±0.06
a	9.16	+0.05	8.98	−0.13	9.18	+0.07	9.11	9.41	±0.08
R	9.56	+0.21	9.28	−0.07	9.22	−0.13	9.35	9.65	±0.14
U	9.51	−0.07	9.66	+0.08	9.58	0.00	9.58	9.88	±0.05
1U	10.15	+0.05	10.05	−0.05	10.11	+0.01	10.10	10.40	±0.04
Mean							9.54	9.84	±0.08
12-INCH.									
Star.	February 3.		February 27.		March 3.		Mean.		
	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag. H.	Mag. P.	Δ Mag.
a	9.05	−0.04	9.00	−0.09	9.21	+0.12	9.09	9.39	±0.08
R	9.10	−0.05	9.29	+0.14	9.07	−0.08	9.15	9.45	±0.09
U	9.80	+0.03	9.74	−0.03	9.77	0.00	9.77	10.07	±0.02
1U	10.19	+0.05	10.12	−0.02	10.12	−0.02	10.14	10.44	±0.03
Mean							9.54	9.84	±0.06
b	12.16	−0.13	12.24	−0.05	12.47	+0.18	12.29	12.59	±0.12
c	12.39	−0.04	12.42	−0.01	12.48	+0.05	12.43	12.73	±0.03
d	10.65	−0.02	10.67	0.00	10.69	+0.02	10.67	10.97	±0.01
f	10.46	−0.11	10.63	+0.06	10.63	+0.06	10.57	10.87	±0.08
Mean							11.49	11.79	±0.06
40-INCH.									
Star.	March 5.		April 1.		April 6.		Mean.		
	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag. H.	Mag. P.	Δ Mag.
b	12.08	−0.04	12.06	−0.06	12.23	+0.11	12.12	12.42	±0.07
c	12.05	−0.15	12.26	+0.06	12.28	+0.08	12.20	12.50	±0.10
d	10.95	+0.04	10.95	+0.04	10.82	−0.09	10.91	11.21	±0.06
f	10.89	+0.16	10.68	−0.05	10.63	−0.10	10.73	11.03	±0.10
Mean							11.49	11.79	±0.08
u	12.81	0.00	12.82	+0.01	12.81	0.00	12.81	13.11	0.00
z	12.75	−0.08	13.04	+0.21	12.69	−0.14	12.83	13.13	±0.14
a	14.17	+0.09	13.97	−0.11	14.09	+0.01	14.08	14.38	±0.07
β	13.92	−0.16	14.42	+0.34	13.89	−0.19	14.08	14.38	±0.23
γ	14.16	−0.01	14.43	+0.26	13.92	−0.25	14.17	14.47	±0.17
δ	14.73	−0.03	14.68	−0.02	14.68	−0.02	14.70	15.00	±0.02
ε	13.23	+0.04	13.38	+0.19	12.97	−0.22	13.19	13.49	±0.15

TABLE 39.--4315 R COMÆ. VISUAL OBSERVATIONS OF THE VARIABLE.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
1894												
1	Mar. 9	..	2410000+ 2897	150?	6	v not seen, limit < 12 ^m ..	.....	< 12	poor	...	...	...
2	26	9	2914.60	150?	6	v not seen, limit < 12 ^m ..	.....	< 12	good	...	...	...
3	Apr. 7	8	2926.61	150?	6	v not seen, limit < 12 ^m ..	.....	< 12	good	...	...	...
4	22	9	2941.64	...	6	v not seen, limit < 12 ^m ..	.....	< 12	fine	...	...	...
5	May 4	9	2953.63	150	6	v not seen, limit <i>b</i> ..	.....	< 12.3	fair	...	...	...
6	10	9	2959.63	...	6	v not seen ..	.....	...	poor	...	...	...
7	11	9	2960.63	150	6	v not seen, limit <i>i</i> < <i>b</i> ..	.....	< 12.4	good	...	...	...
8	31	10	2980.67	40	6	v not seen, limit <i>b</i> ..	.....	< 12.3	good	...	...	...
9	June 6	10	2986.65	150	6	v glimpsed, <i>b</i> ₁ -2 <i>v</i> ..	.....	15.6	12.26	good	0	-0.74
10	18	9	2998.63	...	6	v not seen, limit <i>i</i> -2 < <i>e</i> ..	.....	< 19	< 11.8	fair	...	...
11	20	9	3000.63	150	6	<i>vc</i> , <i>v</i> ₁ -2 <i>b</i> ..	18.6, 18.6 ..	18.6	11.85	fair	14	-0.70
12	24	10	3004.67	150	6	<i>v</i> ₁ -2 <i>c</i> , <i>v</i> ₁ -2 <i>b</i> , <i>e</i> ₃ <i>v</i> ..	20.1, 18.6, 18.3 ..	19.0	11.80	fair	18	-0.60
13	30	10	3010.67	40	6	<i>v</i> ₂ <i>c</i> , <i>e</i> ₁ -2 <i>v</i> ..	20.6, 19.8 ..	20.2	11.61	good	24	-0.43
14	July 6	10	3016.65	150	6	<i>v</i> ₂ -3 <i>c</i> , <i>e</i> ₂ <i>v</i> ..	21.1, 19.3 ..	20.2	11.61	moon	30	-0.21
15	23	9	3033.63	40	6	<i>x</i> ₁ -2 <i>v</i> , <i>v</i> ₄ <i>f</i> , <i>f</i> ₄ <i>e</i> ..	30.4, 30.4 ..	30.4	10.27	fair	47	-0.72
1896												
16	May 28	9	3708.63	...	6	v not seen, limit 4 < <i>e</i> ..	.....	< 17	< 12.0	good	2	...
17	June 6	9	3717.63	150	6	v glimpsed, <i>e</i> ₃ <i>v</i>? ..	.....	8.3	11.88	fair	11	-0.73
18	10	9	3721.63	...	6	v not seen ..	.....	...	...	fine	15	...
19	30	9	3741.63	150	6	v not seen, limit 3 < <i>e</i> ..	.....	< 18	< 11.9	fair	35	...
20	July 6	10	3747.67	150	6	<i>e</i> ₄ <i>v</i> , limit <i>i</i> < <i>v</i> ..	.....	17.3	12.01	good	41	+0.80
21	11	9	3752.63	150	6	<i>ve</i>± ..	.....	21.3	11.48	poor	46	+0.48
22	24	9	3765.63	...	6	<i>R</i> ₁ -2 <i>v</i> ..	.....	37.5	9.38	moon	59	-0.73
23	Aug. 3	9	3775.63	40	6	<i>R</i> ₁ <i>v</i> , <i>v</i> ₁ -2 <i>1U</i> ..	37.0, 34.1 ..	36.0	9.58	fair	69	+0.15
24	8	9	3780.63	80	6	<i>R</i> ₁ ±, <i>v</i> ₁ <i>1U</i> ..	39.0, 33.6 ..	36.3	9.53	...	74	+0.35
25	10	8	3782.58	40	6	<i>vo</i> -1 <i>R</i> , <i>v</i> ₂ -3 <i>1U</i> , <i>a</i> ₃ <i>v</i> , <i>p</i> ₅ <i>v</i> ..	39.0, 35.1, 37.9, 39.2 ..	37.8	9.35	fair	76	+0.25
26	17	8	3789.58	...	6	<i>vo</i> -1 <i>R</i> , <i>P</i> ₃ -4 <i>v</i> , <i>a</i> ₁ -2 <i>v</i> ..	39.5, 40.7, 39.4 ..	39.8	9.10	fair	83	+0.20
27	26	8	3798.57	40	6	<i>v</i> ₁ <i>R</i> , <i>P</i> ₃ -4 <i>v</i> , <i>v</i> ₁ <i>a</i> ..	39.0, 40.7, 41.4 ..	40.4	9.03	fair	92	+0.22
28	Nov. 12	17	3876.96	...	6	<i>v</i> ₁ <i>f</i> , <i>v</i> ₁ <i>d</i> , <i>v</i> ₈ <i>e</i> ..	26.4, 26.4, 29.3 ..	26.4	10.79	good	170	+0.24
29	Dec. 2	18	3897.00	150	6	<i>d</i> ₄ <i>v</i> , <i>v</i> ₁ -2 <i>e</i> ..	21.4, 22.8 ..	21.6	11.42	good	191	+0.02
				40	6	<i>d</i> ₆ <i>v</i> ..	19.4 ..					
1897												
30	Jan. 7	18	3933.00	150	6	<i>e</i> ₆ -8 <i>v</i> , <i>e</i> ₂ ₃ <i>v</i> ..	14.3, 13.3 ..	13.8	12.50	good	227	+0.28
31	July 2	9	4108.63	40	6	<i>ve</i> , <i>d</i> ₃ <i>v</i> ..	21.3, 22.4 ..	21.8	11.40	good	42	+0.20
32	8	9	4114.63	40	6	<i>v</i> ₂ <i>d</i> , <i>v</i> ₃ <i>f</i> , <i>1U</i> ₅ <i>v</i> ..	27.4, 29.4, 27.6 ..	28.1	10.58	good	48	-0.34
33	16	9	4122.63	40	6	<i>R</i> ₅ <i>v</i> , <i>v</i> ₃ -4 <i>1U</i> , <i>R</i> ₃ -4 <i>v</i> ..	34.0, 36.1, 35.5 ..	35.2	9.68	good	56	-0.60
34	21	9	4127.63	40	6	<i>R</i> ₁ -2 <i>v</i> , <i>v</i> ₃ -4 <i>1U</i> ..	37.5, 38.1 ..	37.8	9.36	good	61	-0.42
35	27	10	4133.67	40	6	<i>v</i> ₁ <i>R</i> , <i>a</i> ₂ <i>v</i> ..	40.0, 38.9 ..	39.4	9.12	good	67	-0.36
36	Aug. 1	9	4138.61	40	6	<i>v</i> ₆ <i>R</i> , <i>P</i> ₀ -1 <i>v</i> , <i>v</i> ₂ -3 <i>a</i> ..	45.0, 43.7, 43.4 ..	43.8	8.61	good	72	-0.58
37	6	8	4143.58	40	6	<i>v</i> ₂ <i>P</i> ..	.....	46.2	8.33	good	77	-0.34
38	11	8	4148.58	40	6	<i>F</i> ₆ <i>v</i> , <i>v</i> ₂ <i>P</i> , <i>H</i> ₃ -4 <i>v</i> ..	46.9, 46.2, 45.7 ..	46.3	8.32	good	82	-0.60
39	13	8	4150.58	40	6	<i>F</i> ₅ <i>v</i> , <i>v</i> ₁ <i>P</i> , <i>H</i> ₃ -4 <i>v</i> ..	47.9, 45.2, 45.7 ..	45.9	8.37	poor	84	-0.51
40	19	8	4156.58	40	6	<i>F</i> ₅ <i>v</i> , <i>v</i> ₁ <i>P</i> , <i>H</i> ₃ <i>v</i> ..	47.9, 45.2, 46.2 ..	46.4	8.31	fair	90	-0.50
41	20	8	4157.58	40	6	<i>F</i> ₅ <i>v</i> , <i>v</i> ₁ <i>P</i> , <i>H</i> ₄ <i>v</i> ..	47.9, 45.2, 45.2 ..	45.8	8.38	good	91	-0.42
42	24	8	4161.57	40	6	<i>F</i> ₅ -6 <i>v</i> , <i>v</i> ₂ -3 <i>P</i> , <i>H</i> ₄ <i>v</i> ..	47.4, 46.7, 45.2 ..	46.4	8.31	fair	95	-0.49
43	27	8	4164.57	40	6	<i>F</i> ₅ <i>v</i> , <i>v</i> ₂ <i>P</i> , <i>H</i> ₃ -4 <i>v</i> ..	47.9, 46.2, 45.7 ..	46.6	8.30	fair	98	-0.50
44	29	8	4166.57	40	6	<i>F</i> ₅ <i>v</i> , <i>v</i> ₂ <i>P</i> , <i>H</i> ₃ <i>v</i> ..	47.9, 46.2, 46.2 ..	46.8	8.28	good	100	-0.51
45	Sept. 27	17	4195.96	...	6	<i>j</i> limit, <i>v</i> not seen ..	.....	< 53	< 7.5	poor	...	...
46	30	17	4198.96	150	6	<i>P</i> ₄ -5 <i>v</i> , <i>v</i> ₁ <i>R</i> ± ..	39.7, 39.0 ..	39.3	9.15	poor	132	+0.03
47	Oct. 8	17	4206.96	40	6	<i>R</i> ₃ <i>v</i> , <i>v</i> ₃ <i>1U</i> ..	36.0, 35.6 ..	35.8	9.60	good	140	+0.30
48	25	17	4223.96	40	6	<i>1U</i> ₄ <i>v</i> , <i>v</i> ₁ <i>f</i> , <i>v</i> ₂ <i>d</i> ..	28.6, 27.4, 27.4 ..	27.9	10.60	good	157	+0.58
1898												
49	June 14	10	4455.67	...	12	<i>c</i> ₄ -5 <i>v</i> , <i>v</i> ₂ <i>z</i> ..	14.1, 13.3 ..	13.7	12.52	fair	29	+0.57
50	July 5	10	4476.67	...	12	<i>v</i> ₁ -2 <i>e</i> , <i>d</i> ₃ <i>v</i> ..	22.8, 22.4 ..	22.6	11.30	fair	50	+0.60
51	20	9	4491.63	...	12	<i>v</i> ₅ <i>1U</i> , <i>a</i> ₆ <i>v</i> ..	37.6, 34.9 ..	36.2	9.55	...	65	-0.03
52	Aug. 1	9	4503.61	...	12	<i>F</i> ₈ <i>v</i> , <i>v</i> ₈ <i>P</i> ..	44.9, 52.2 ..	48.6	8.06	poor	77	-1.02±
53	9	...	4513.6	...	12	<i>F</i> ₁₀ <i>v</i> , <i>v</i> ₅ <i>P</i> ..	42.9, 49.2 ..	46.0	8.35	fair	87	-0.45

TABLE 39.—4315 R COMÆ. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
54	1898 Aug. 19	9	2410000+	80	12	<i>P</i> _{2v} , <i>v</i> ₁₀₋₁₂ <i>1U</i> , <i>v</i> _{6-7R} ..	42.2, 43.6, 46.5 ..	43.3	8.67	fair	95	-0.23
55	27	8	4521.60	80	6	<i>F</i> _{12v} , <i>P</i> _{4-5v}	40.9, 38.7	39.4	9.13	good	103	+0.33
56	Sept. 2	8	4529.58	40	6	<i>P</i> _{3-4v} , <i>a</i> _{1v}	40.7, 39.9	40.3	9.04	fair	109	+0.24
57	Nov. 14	17	4535.57	150	6	<i>d</i> _{3v} , <i>v</i> _{1-2e}	22.4, 22.8	22.6	11.30	good	182	+0.22
58	Dec. 23	18	4608.96	150	6	<i>v</i> _{1-2s} , <i>e</i> _{4v} , <i>b</i> _{3v} , <i>c</i> _{3v}	12.8, 17.3, 14.1, 15.6	14.9	12.38	fine	222	+0.24
59	1899 Dec. 14	18	5004.00	...	6	<i>e</i> _{3v} , <i>v</i> _{2e}	18.3, 18.3	18.3	11.88	....	218	-0.17
60	1900 Jan. 20	13	5040.79	350	40	<i>v</i> _{3s} .....	...	14.3	12.42	fair	254	-0.21
61	Feb. 1	18	5053.00	150	6	<i>v</i> not seen, limit $2 < b$ .....	...	<15	<12.3	good	...	...
62	9	16	5060.92	175	12	<i>z</i> _{2-3v} ? not sure .....	...	8.8	13.12	....	274	-0.01
63	18	13	5069.79	350	40	<i>s</i> _{5v} , <i>v</i> _{2-3a}	6.3, 5.5	5.9	13.68	fair	283	+0.36
64	24	11	5073.71	350	40	{ <i>s</i> _{3-4v} , <i>v</i> _{2-3a}	7.8, 5.5	6.6	13.56	fair	287	-0.18
65	Mar. 2	11	5081	275	12	{ <i>s</i> _{1a} , <i>a</i> _{3s} , <i>γ</i> _{1a} .....	...	<8	<13.3	fair	...	...
66	21	11	5100.71	275	12	<i>v</i> not seen, limit $3 < z$ .....	...	<6.3	<13.6	fair	...	...
67	22	11	5101.68	350	40	<i>s</i> _{6a} , <i>v</i> _{1a} , <i>s</i> _{2e} .....	...	4.0	13.95	good	315	+0.25
68	Apr. 4	13	5114.79	275	12	{ <i>a</i> , <i>β</i> , <i>γ</i> <i>s</i> and <i>e</i> seen, limit <i>γ</i>	4.0, 3.0	3.5	14.05	good	328	+0.35
69	6	14	5116.81	350	40	<i>v</i> quite certainly glimpsed .....	...	7.0	13.50	fair	330	-0.30
70	18	9	5128.63	350	40	<i>e</i> _{3v} , <i>v</i> _{4γ} , <i>z</i> _{1-2e} , <i>e</i> _{4-5γ}	6.0, 8.0	8.8	13.22	fair	342	-0.28
71	18	10	5128.65	275	12	<i>v</i> _{3γ} , <i>v</i> _{1-2a} , <i>z</i> _{8v±}	7.0, 10.5	<9.0	<13.	poor	...	...
72	27	...	5137.7	237	40	<i>v</i> not held, <i>e</i> seen. ....	...	8.8	13.2	good	...	...
73	May 8	...	5148.7	350	40	<i>z</i> _{2-3v} , <i>v</i> _{1e}	9.3, 9.0, 8.0	9.4	13.17	fair	2	+0.17
+73	9	...	5149.7	237	40	photometer .....	...	...	13.24	poor	3	+0.26
74	24	...	5164.7	275	12	<i>e</i> _{18-10v} , <i>v</i> _{1-2s} , limit $2 < s$ .....	...	12.8	12.65	good	18	+0.36
75	25	...	5165.7	80	12	<i>v</i> _{2s} .....	...	13.3	12.56	good	19	+0.31
76	28	...	5168.7	275	12	<i>b</i> _{4v} , <i>v</i> _{3s}	13.1, 14.3	13.7	12.52	good	22	+0.41
77	29	...	5169.7	237	40	<i>e</i> _{8v} , <i>v</i> _{3s}	(8.3), 14.3	14.3	12.44	good	23	+0.34
78	30	8	5170.58	237	40	<i>v</i> _{2s} , <i>e</i> _{8v} , <i>v</i> _{3s}	13.3, 14.3	13.8	12.51	good	24	+0.41
79	June 8	11	5179.69	237	40	photometer .....	...	...	11.58	low	33	-0.10
80	15	9	5186.63	150	6	<i>d</i> _{3v} , <i>v</i> _{4b}	22.4, 21.1	21.8	11.40	fair	40	0.00
81	23	10	5194.67	40	6	<i>d</i> _{2v} , <i>v</i> _{2e} , <i>f</i> _{3v} , <i>v</i> _{6-8b}	23.4, 23.4, 23.4(24.1)	23.4	11.19	good	48	+0.21
82	26	9	5196.63	150	6	<i>d</i> _{2v} , <i>v</i> _{6-8e}	23.4, 28.3	24.0	11.10	fair	50	+0.40
83	July 10	9	5211.63	150	6	<i>v</i> _{6-8d}	32.4	33.6	9.87	fair	65	+0.32
84	21	9	5222.61	40	6	<i>v</i> ₃ <i>1U</i> , <i>R</i> _{8v}	35.6, 31.0	36.3	9.52	fair	76	+0.44
85	25	9	5226.63	80	12	<i>R</i> _{3v} , <i>v</i> ₄ <i>1U</i>	36.0, 36.6	37.8	9.24	good	80	+0.25
86	28	8	5229.58	40	6	<i>R</i> _{1v} , <i>v</i> ₅ <i>1U</i>	38.0, 37.6	36.6	9.52	good	83	+0.62
87	Aug. 6	9	5238.60	150	6	<i>R</i> _{1v} , <i>v</i> ₅ <i>1U</i>	38.0, 37.6	36.0	9.45	fair	92	+0.65
88	13	8	5245.58	40	6	<i>R</i> _{2v} , <i>v</i> ₃ <i>1U</i>	37.0, 35.6 .....	...	9.24	....	...	...
89	13	9	5245.58	40	6	photometer .....	...	40.3	9.05	good	99	+0.30
90	14	8	5246.58	40	6	<i>v</i> ₂₋₃ <i>1U</i>	36.1	40.5	9.02	good	100	+0.22
91	18	8	5250.58	150	6	<i>R</i> _{3v}	36.0	37.6	9.38	good	104	+0.58
92	Oct. 25	17	5318.54	67	12	<i>v</i> ₄₋₅ <i>1U</i>	37.1	23.4	11.18	fair	172	+0.48
93	1901 May 18	13	5523.77	80	12	<i>R</i> _{1v}	38.0	11.3	12.85	fair	17	+0.45
94	1902 Jan. 10	14	5760.83	237	40	<i>v</i> _s , near limit .....	...	...	12.80	poor	254	-0.02
95	Feb. 11	12	5792.75	237	40	photometer .....	...	...	13.42	fair	286	+0.10
96	22	...	5803	...	24	photograph .....	...	...	...	....	...	...
97	Mar. 15	13	5824.79	350	40	<i>s</i> _{5-6v} , <i>v</i> _a , <i>v</i> _{3γ} , <i>v</i> _{4a}	5.8, 9.0 7.0, 7.0 ..	6.6	13.57	fair	318	-0.13
98	Apr. 12	12	5852.75	237	40	photometer .....	...	...	13.48	good	346	+0.06

TABLE 39.—4315 R COMÆ. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

No.	Date.			Ocular.	Aperture.	Comparison.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
	1901		2410000+									
99	May 2	13	5872.77	237	40	photometer.....	.....	.....	12.71	good	6	−0.17
100	25	14	5895.83	237	40	photometer.....	.....	.....	12.14	fair	29	+0.22
101	June 3	10	5904.67	67	12	photometer.....	.....	.....	11.49	fine	38	−0.03
102	9	9	5910.63	67	12	photometer.....	.....	.....	11.03	fair	44	−0.08
103	25	10	5926.67	67	12	photometer.....	.....	.....	9.43	fair	60	−0.36
104	30	9	5931.63	67	12	photometer.....	.....	.....	8.97	good	65	−0.60
	1903											
105	Jan. 9	16	6124.92	237	40	z4v, v ₄ (?), v8v.....	7.3, 9.0, 12.0.....	8.6	13.28	fair	258	+0.38
106	May 17	9	6252.63	67	12	v not seen, limit 1 ^M < d.....	.....	.....	< 11.7	poor	...	....
	1904											
107	Mar. 22	13	6562.79	237	40	photometer.....	.....	.....	13.50	fine	336	−0.11
108	May 3	10	6604.67	67	12	c4-5v, v1u, v2z.....	14.1, 16.5, 13.3 ..	14.6	12.9	dull	18	+0.5
109	10	7	6611.54	40	6	u3v, v1-2z, z glimpsed....	12.5, 12.8.....	12.7	12.67	good	25	+0.58
110	June 17	11	6649.71	40	6	photometer.....	.....	.....	10.54	fair	63	+0.88
111	July 4	10	6666.67	40	6	photometer.....	.....	.....	9.54	fair	80	+0.55
112	9	9	6671.63	40	6	photometer.....	.....	.....	9.29	good	85	+0.39
113	Aug. 2	..	6695.6	67	12	photometer.....	.....	.....	8.41	good	109	−0.39
114	27	8	6720.58	40	6	P1-2v, a or R not seen ..	.....	42.7	8.78	good	134	−0.40
	1905											
115	Jan. 3	13	6849.79	237	40	v4z.....	.....	15.3	12.29	good	263	−0.70
116	29	14	6875.83	237	40	z1v, v1e.....	10.3, 10.0.....	10.2	13.00	good	289	−0.39
117	Feb. 27	10	6904.67	67	12	v not seen, limit z.....	.....	< 11.3	< 12.9	good	318	−0.39
				275	12	v glimpsed ? z3v±.....	.....	8.3	13.31			
118	Mar. 5	15	6910.88	237	40	e4-5v, v1y, or v _y , v1e....	4.5, 4.5, 4.0 ..	4.3	13.90	good	324	+0.21
119	12	13	6917.77	237	40	e3v, v3y.....	6.0, 7.0.....	6.5	13.59	good	331	−0.10
120	24	9	6929.60	150	6	(u and companion both seen, z limit, about 12 ^M .6, v (not seen.)	.....	< 11	< 12.9	fair		
121	25	10	6930.67	250	40	z5v, e1v, v4y.....	6.3, 8.0, 8.0.....	7.4	13.45	good	344	−0.03
122	26	10	6931.67	237	40	photometer.....	.....	.....	(14.42)	fair	354	+0.17
123	Apr. 1	9	6937.63	237	40	photometer.....	.....	.....	13.76	fair	351	+0.46
124	4	14	6940.83	237	40	e1v, v3y.....	8.0, 7.0.....	7.5	13.43	good	358	+0.05
125	8	9	6944.63	237	40	e0-1v, v6y.....	8.5, 10.0.....	9.0	13.20	fair	1	+0.60
126	11	15	6947.96	237	40	e2v, v3-4y.....	7.0, 7.5.....	7.2	13.48	low	12	0.50
127	30	10	6966.67	237	40	v 5-6y, v2e, v _z	9.5, 11.0, 11.3....	10.8	12.92	good	20	+0.72
128	May 31	9	6997.63	150	6	d4v, ve, v6=8b.....	21.4, 21.3, 24.1 ..	21.0	11.50	fair	51	+0.90
129	June 22	9	7019.63	40	6	R2v, v-1U.....	37.0, 32.6.....	33.3	9.90	poor	73	+0.70
130	July 24	9	7051.63	40	6	v5d.....	30.4.....	.....	.....	good	105	+0.12
131	Aug. 9	8	7067.60	40	6	P3v, va, v6R.....	41.2, 40.9, 45.0 ..	41.7	8.90			
						P6v, a1v.....	38.2, 39.9.....	39.3	9.18	fair	121	+0.27

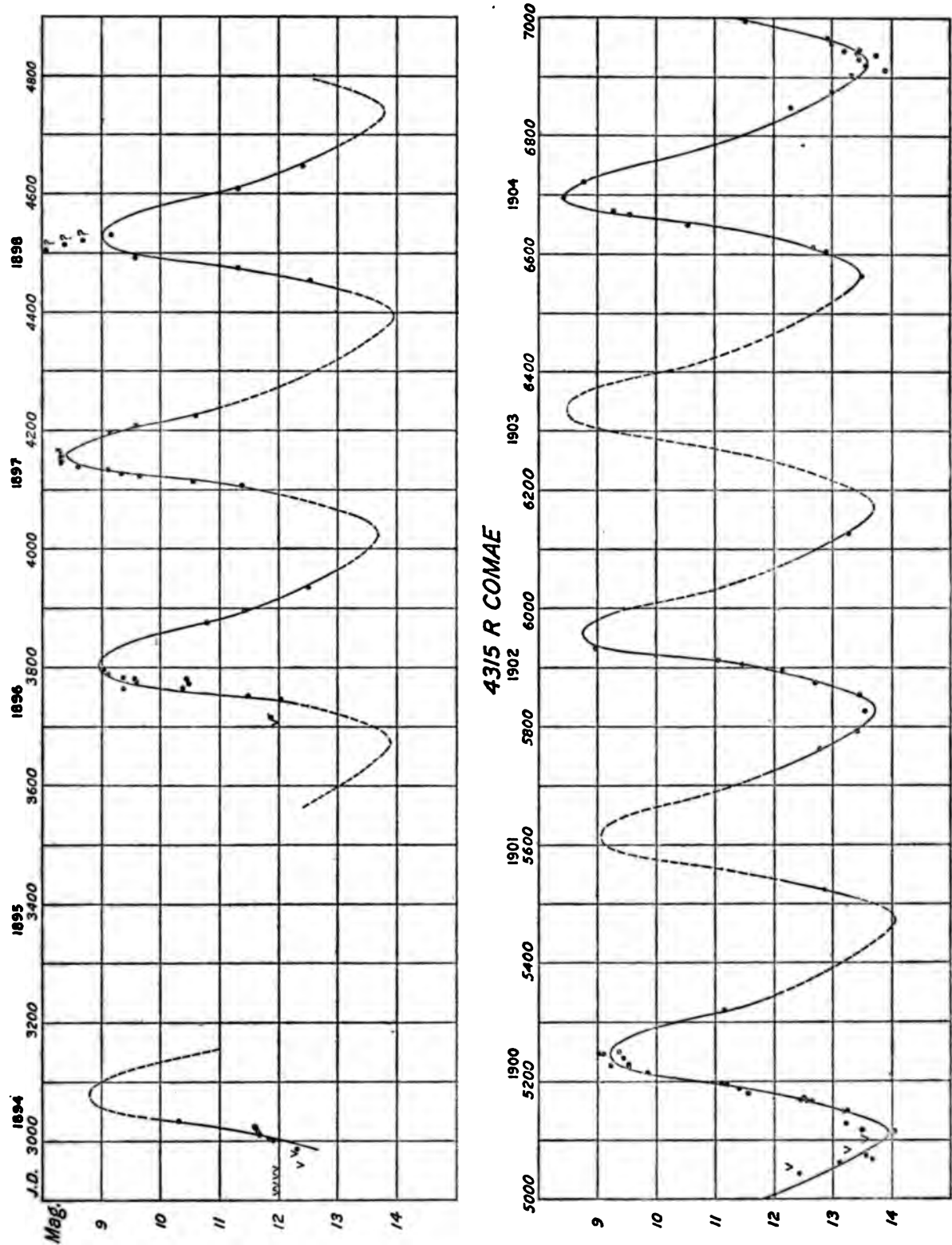


FIG. 14.—LIGHT-CURVE OF R COMÆ.

TABLE 40.—4315 R COMÆ. MEAN MAGNITUDES FROM 30 DAY GROUPS.

Group No.	1	2	3	4	5	6	7	8	9	10	11	12
J. D.	30	60	90	120	150	180	210	240	270	300	330	360
2986 {	<i>t</i>	14	38	....	....	....	....	....	....	....	....	....
	<i>M</i>	11.87	10.94	....	....	....	....	....	....	....	....	....
	ΔM	-0.62	-0.46	....	....	....	....	....	....	....	....	....
	No.	4	2	....	....	....	....	....	....	....	....	....
3706 {	<i>t</i>	11	48	76	92	....	170	190	227	....	....	....
	<i>M</i>	11.88	10.96	9.39	9.03	....	10.79	11.42	12.50	....	....	....
	ΔM	-0.73	+0.18	+0.24	+0.22	....	+0.24	+0.02	+0.28	....	....	....
	No.	1	3	4	1	....	1	1	1	....	....	....
4066 {	<i>t</i>	....	49	74	95	136	157	....	....	....	....	....
	<i>M</i>	....	10.55	8.68	8.32	9.38	10.60	....	....	....	....	....
	ΔM	....	-0.25	-0.47	-0.48	+0.16	+0.58	....	....	....	....	....
	No.	....	3	6	5	2	1	....	....	....	....	....
4426 {	<i>t</i>	29	50	76	102	....	....	182	222	....	....	....
	<i>M</i>	12.52	11.30	8.65	8.95	....	....	11.30	12.38	....	....	....
	ΔM	+0.57	+0.60	-0.50	+0.11	....	....	+0.22	+0.24	....	....	....
	No.	1	1	3	3	....	....	1	1	....	....	....
4786 {	<i>t</i>	....	....	....	....	....	....	218	254	281	322	336
	<i>M</i>	....	....	....	....	....	....	11.88	12.42	13.45	14.00	13.36
	ΔM	....	....	....	....	....	....	-0.17	-0.21	+0.18	+0.30	-0.29
	No.	....	....	....	....	....	....	1	1	3	2	2
5146 {	<i>t</i>	15	43	76	99	....	172	....	....	....	....	....
	<i>M</i>	12.58	11.32	9.54	9.24	....	11.18	....	....	....	....	....
	ΔM	+0.22	+0.13	+0.41	+0.44	....	+0.48	....	....	....	....	....
	No.	7	4	4	4	....	2	....	....	....	....	....
5506 {	<i>t</i>	17	....	....	....	....	....	....	254	286	318	346
	<i>M</i>	12.85	....	....	....	....	....	....	12.80	13.42	13.57	13.48
	ΔM	+0.45	....	....	....	....	....	....	-0.02	+0.10	-0.13	+0.06
	No.	1	....	....	....	....	....	....	1	1	1	1
5866 {	<i>t</i>	18	41	62	....	....	....	....	258	....	....	336
	<i>M</i>	12.42	11.26	9.20	....	....	....	....	13.28	....	....	13.50
	ΔM	+0.02	-0.06	-0.48	....	....	....	....	+0.38	....	....	-0.11
	No.	2	2	2	....	....	....	....	1	....	....	1
6586 {	<i>t</i>	22	....	76	109	134	....	....	263	289	321	343
	<i>M</i>	12.8±	....	9.46	8.41	8.78	....	....	12.29	13.00	13.61	13.56
	ΔM	+0.5±	....	+0.61	-0.39	-0.40	....	....	-0.70	-0.39	-0.09	+0.14
	No.	2	....	3	1	1	....	....	1	1	2	4
6946 {	<i>t</i>	....	....	....	....	....	....	....	....	....	....	....
	<i>M</i>	....	....	....	....	....	....	....	....	....	....	....
	ΔM	....	....	....	....	....	....	....	....	....	....	....
	No.	....	....	....	....	....	....	....	....	....	....	....
Means {	<i>t</i>	17	45	74	98	135	168	186	222	257	284	321
	<i>M</i>	12.40	11.03	9.12	8.78	9.18	10.94	11.36	12.25	13.35	13.76	13.49
	ΔM	±0.02	-0.01	-0.03	-0.03	-0.03	+0.43	+0.12	+0.12	-0.14	+0.05	+0.06
	No.	18	15	22	14	3	4	2	3	4	5	8

TABLE 41.—4315 R COMÆ. OBSERVED MAXIMA AND MINIMA.

Elements of maximum. 1856 Dec. 20 (J. D. 2399304)+361.8^d E. $M - m = 11.9^d$.

MAXIMA.							MINIMA.						
Epoch.	Date.		Mag.		Corr.	Wt.	Epoch.	Date.		Mag.		Corr.	Wt.
	Calendar.	J. D.	H.	P.				Calendar.	J. D.	H.	P.		
38	1894 Sept. 3	3075	mc	....	+23	4	40	1896 Apr. 30	3680	mc	....	+23	2
40	1896 Aug. 30	3802	8.92	9.22	+26	13	41	1897 Apr. 14	4029	mc	....	+9	4
41	1897 Aug. 19	4156	8.40	8.70	+18	23	42	1898 Apr. 13	4393	mc	....	+12	4
42	1898 Aug. 23	4525	9.0±	9.3±	+25	15	43	1899 Apr. 1	4746	mc	....	+4	2
44	1900 Aug. 10	5242	9.20	9.50	+19	17	44	1900 Apr. 1	5111	13.98	14.28	+7	27
45	1901 Aug. 15	5612	mc	....	+27	1	45	1901 Mar. 26	5470	mc	....	+4	3
46	1902 July 29	5960	mc	....	+13	4	46	1902 Mar. 17	5826	13.73	14.03	-2	11
48	1904 July 28	6690	8.40	8.70	+20	5	47	1903 Feb. 25	6171	13.7±	14.0±	-19	1
49	1905 July 24	7051	8.90	9.20	+19	5	48	1904 Mar. 24	6564	mc	....	+13	3
							49	1905 Mar. 17	6922	13.67	13.97	+9	18

TABLE 42.—R COMÆ. VARIOUS DETERMINATIONS OF COMPARISON STARS.

Star.	Hagen.	HCO.	H. M. Parkhurst.	J. A. Parkhurst.	
				H.	P.
<i>F</i>	8.2	7.61	7.82	7.62	7.92
<i>a</i>	8.6	....	8.90	9.09	9.39
<i>R</i>	8.8	9.01	9.36	9.15	9.45
<i>1U</i>	9.3	9.62	10.11	10.14	10.44
<i>d</i>	10.0	10.81	10.97	10.67	10.97
<i>c</i>	10.8	12.46	....	12.43	12.73
<i>u</i>	....	13.20	....	12.81	13.11

Some of the various magnitude scales for the comparison stars are collected in Table 42. It will be seen that the Hagen scale is very much compressed, the interval between *F* and *c* being only 2.6 magnitudes, whereas it is 4.81 by my measures and 4.85 by the Harvard measures. This may be due in part to the yellow color of the star *F*, but seems mainly due to the star *c*. No magnitudes have heretofore been published for stars suitable for comparison with the variable near minimum, evidently because it has not been observed at that part of the light curve.

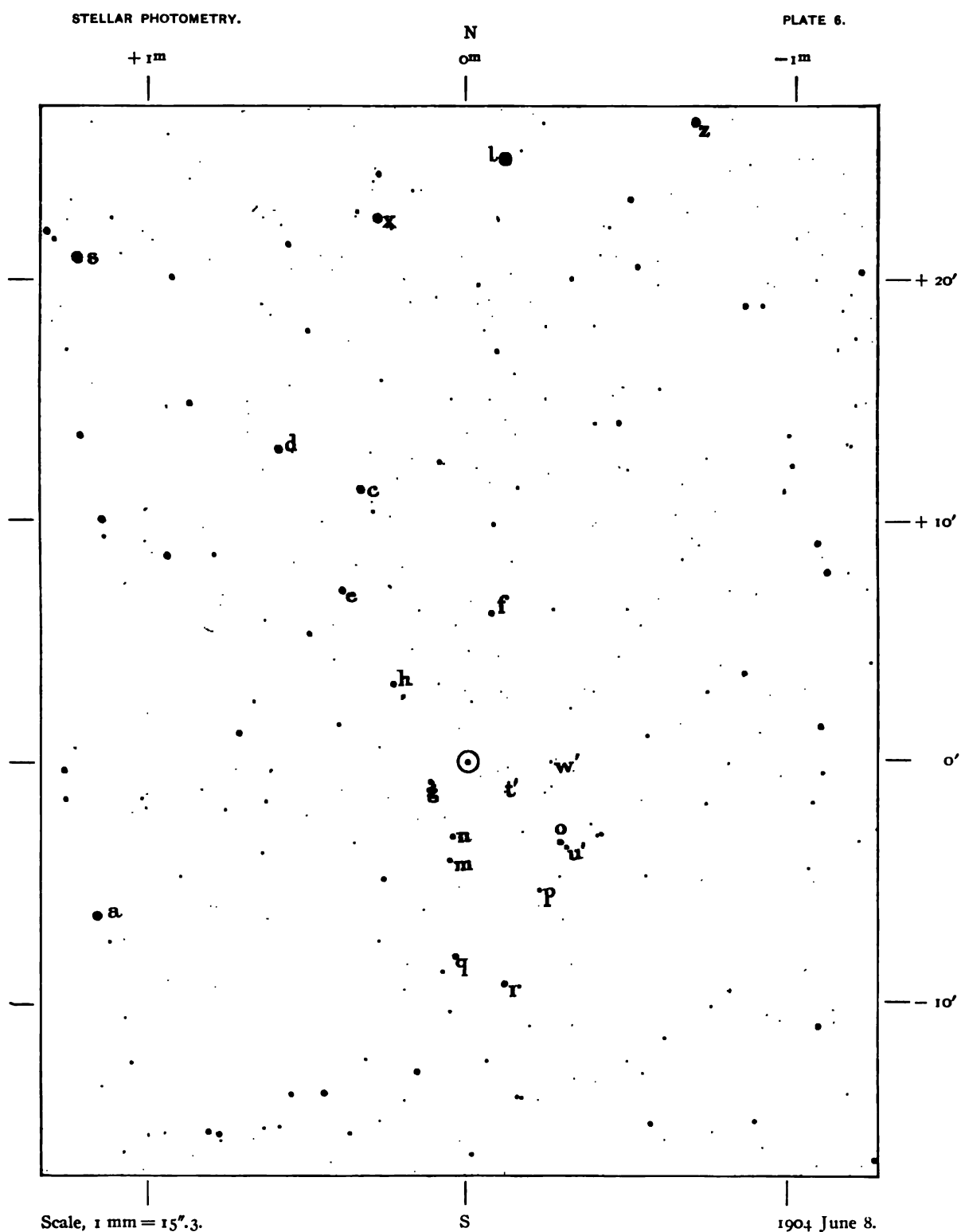
The redness of the variable is given as 4.0 in Chandler's Third Catalogue. Photographically it is at least one magnitude fainter than γ at minimum.

TABLE 44.—5798 RU HERCULIS. COMPARISON STARS IN B. D. CATALOGUE.

Star.	B. D.		1855.				Star.	B. D.		1855.			
	No.	Mag.	R. A.		Dec.			No.	Mag.	R. A.		Dec.	
			h	m s	°	'				h	m s	°	'
u	+25 3031	8.3	16	1 21	+25	17.9	x	+25 3040	9.5	16	4 28	+25	50.0
t	+25 3036	8.4	16	2 48	+25	18.8	a	+25 3042	8.5	16	5 19	+25	20.2
z	+25 3037	9.5	16	3 29	+25	53.5	s	+25 3044	8.8	16	5 23	+25	48.2
w	+25 3038	9.5	16	4 2	+25	6.5	b	+25 3046	9.0	16	5 48	+25	36.5

TABLE 45.—COMPARISON STARS FOR RU HERCULIS.

Star.	Coordinates from Variable.			Light Scale, Steps.	Magnitude.			
	R. A.		Dec.		Measured.		From Curve.	
					H.	P.	H.	P.
	"	s	"					
u	-2273	-167.9	- 558	26.5	.....	.....	8.81	9.08
t	-1110	- 82.0	- 493	26.7	.....	.....	8.80	9.07
z	- 560	- 41.4	+1580	17.0	10.15	10.42	.....	.....
w'	- 208	- 15.4	+ 1	-7.5	14.68	14.95	.....	.....
y	- 199	- 14.7	+2575	17.5	.....	.....	10.36	10.63
p	- 179	- 13.2	- 315	0	13.42	13.69	.....	.....
t'	- 99	- 7.3	- 12	-9.1	15.23	15.50	.....	.....
r	- 94	- 6.9	- 546	.....	.....	.....	.....	.....
l	- 87	- 6.4	+1491	34.0	7.39	7.66	.....	.....
w	- 84	- 6.2	-1239	15.0	.....	.....	10.77	11.04
f	- 59	- 4.4	+ 368	10.0	.....	.....	11.64	11.91
q	+ 24	+ 1.8	- 481	12.0	.....	.....	11.29	11.56
n	+ 35	+ 2.6	- 184	2.8	12.75	13.02	.....	.....
m	+ 44	+ 3.3	- 243	4.1	12.40	12.67	.....	.....
g	+ 91	+ 6.7	- 49	8.0	11.96	12.23	.....	.....
h	+ 187	+ 13.8	+ 191	6.0	12.06	12.33	.....	.....
x	+ 232	+ 17.1	+1342	16.4	.....	.....	10.54	10.81
c	+ 267	+ 19.7	+ 669	14.0	.....	.....	10.94	11.21
e	+ 313	+ 23.1	+ 423	10.1	11.39	11.66	.....	.....
d	+ 473	+ 35.0	+ 771	13.1	.....	.....	11.09	11.36
a	+ 921	+ 68.1	- 384	29.7	8.61	8.88	.....	.....
s	+ 981	+ 72.5	+1239	26.9	9.22	9.49	.....	.....
b	+1335	+ 98.6	+ 580	21.0	9.58	9.85	.....	.....



5798 RU HERCULIS
R. A. 16^h 6^m 2^s.7. Dec. + 25° 19' 56", 1900.

TABLE 46.—5798 RU HERCULIS. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1904 August 11.			12-INCH.				Good.	
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
18 2	29	^o						
		m	54.8 54.3 53.5	54.20	53.30	5.10	12.55	12.82
		n	57.4 58.2 58.3	57.97	56.79	5.33	12.78	13.05
		v	34.5 35.8 35.4	35.23	.....	3.22	10.67	10.94
		g	46.4 46.4 46.9	46.57	48.05	4.63	12.08	12.35
		h	48.3 47.8 47.3	47.80	48.19	4.59	12.04	12.31
		e	43.0 42.9 43.1	43.00	42.52	4.06	11.51	11.78
		a	15.0 14.9 14.8	14.90	15.25	1.08	8.53	8.80
		b	23.9 24.0 25.0	24.30	23.89	2.10	9.55	9.82
		s	18.5 18.7 19.2	18.80	20.77	1.80	9.25	9.52
		z	30.6 31.2 30.6	30.80	31.14	2.77	10.22	10.49
		z	31.8 31.1 31.5	31.47	.....	.....	.....	.....
		s	22.0 23.7 22.5	22.73	.....	.....	.....	.....
		b	23.1 23.5 23.8	23.47	.....	.....	.....	.....
		a	15.7 16.0 15.1	15.60	.....	.....	.....	.....
		e	42.0 42.0 42.2	42.07	.....	.....	.....	.....
18 28	33	h	48.1 49.2 48.4	48.57	.....	.....	.....	.....
		g	49.1 50.7 48.8	49.53	.....	.....	.....	.....
		n	55.1 55.7 56.0	55.60	.....	.....	.....	.....
		m	52.4 52.8 52.0	52.40	.....	.....	.....	.....
1904 September 8.			Fair to good; quiet; rather dull.					
19 20	42	z	24.6 24.2 23.2	24.00	24.99	2.20	10.13	10.40
		s	16.9 16.8 15.9	16.53	16.47	1.25	9.18	9.45
		b	18.1 18.6 18.9	18.53	19.43	1.63	9.56	9.83
		a	11.8 12.2 12.4	12.13	12.75	0.76	8.69	8.96
		m	47.0 46.1 46.2	46.43	45.00	4.33	12.26	12.53
		n	50.3 50.0 49.1	49.80	50.44	4.85	12.78	13.05
		g	40.0 40.6 40.6	40.40	40.63	3.85	11.78	12.05
		v	17.8 15.3 16.2	16.43	16.70	1.29	9.22	9.49
		h	43.7 43.1 43.6	43.47	43.20	4.12	12.05	12.32
		e	36.1 35.7 36.3	36.03	36.50	3.37	11.30	11.57
		e	37.2 36.8 36.9	36.97	.....	.....	.....	.....
		h	42.8 42.9 43.1	42.93	.....	.....	.....	.....
		v	17.7 17.7 15.5	16.97	.....	.....	.....	.....
		g	41.1 41.1 40.3	40.83	.....	.....	.....	.....
		n	52.1 50.0 51.1	51.07	.....	.....	.....	.....
		19 47	47	m	45.2 46.2 45.3	45.57
a	13.5 13.7 12.9			13.37	.....	.....	.....	.....
b	21.0 20.3 19.7			20.33	.....	.....	.....	.....
s	16.0 16.4 16.8			16.40	.....	.....	.....	.....
1904 September 9.			Quiet; quite good.					
19 0	39	z	30.0 30.0 29.8	29.93	30.15	2.67	10.11	10.38
		s	19.8 19.2 19.6	19.53	20.72	1.79	9.23	9.50
		b	23.2 23.5 23.2	23.33	24.77	2.18	9.62	9.89
		a	15.8 16.8 15.8	16.13	15.82	1.17	8.61	8.88
		m	51.5 51.4 50.8	51.57	51.75	4.96	12.40	12.67
		n	55.2 55.1 55.6	55.30	55.47	5.25	12.69	12.96
		v	19.6 18.8 19.8	19.40	19.10	1.61	9.05	9.32
		g	47.3 48.8 47.8	47.97	47.64	4.59	12.03	12.30
		h	50.0 49.2 49.2	49.47	48.35	4.65	12.09	12.36
		e	40.2 41.2 41.9	41.10	41.19	3.91	11.35	11.62
		e	41.0 41.2 41.6	41.27	.....	.....	.....	.....
		h	46.2 47.5 48.0	47.23	.....	.....	.....	.....
		g	47.0 47.6 47.3	47.30	.....	.....	.....	.....
		v	19.8 17.8 18.8	18.80	.....	.....	.....	.....
		n	54.0 55.8 57.1	55.63	.....	.....	.....	.....
		19 27	44	m	52.0 52.1 51.7	51.93
a	15.2 15.8 15.5			15.50	.....	.....	.....	.....
b	26.7 26.3 25.6			26.20	.....	.....	.....	.....
s	22.2 21.6 21.9			21.90	.....	.....	.....	.....
			z	30.6 30.5 30.0	30.37	.....	.....	.....

TABLE 47.—5798 RU HERCULIS. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

6-INCH.															
Star.	1904 July 31.					1904 September 3.					1904 September 4.				
	C.	Obs. Mag.		Δ Mag.		C.	Obs. Mag.		Δ Mag.		C.	Obs. Mag.		Δ Mag.	
		H.	P.	H.	P.		H.	P.	H.	P.		H.	P.	H.	P.
<i>B</i>	−0.59	6.57	6.84	−.11	−.04	−0.68	6.56	6.83	−.12	−.05	0.03	6.73	7.00	+ .05	+ .12
<i>C</i>	0.40	7.56	7.83	+ .19	+ .03	0.29	7.53	7.80	+ .16	.00	0.79	7.49	7.76	+ .12	−.04
<i>l</i>	0.24	7.40	7.67	−.08	−.01	0.20	7.44	7.71	−.04	+ .03	0.63	7.33	7.60	−.15	−.08
Means.	0.02	7.18	7.45	± .13	± .03	−0.06	7.18	7.45	± .07	± .03	0.48	7.18	7.45	± .11	± .08
<i>M</i> ₀....	....	7.16	7.43	.....	.....	....	7.24	7.51	.....	.....	....	6.70	6.97	.....	.....

12-INCH.					40-INCH.					
Star.	Mag. 6-inch.	C.			Star.	Mag. 12-inch.	C.			
		Sept. 9.	Aug. 11.	Sept. 8			Mar. 5.	Mar. 15.	May 2.	Mar. 15.
<i>a</i>	8.65	1.17	1.08	0.76	<i>g</i>	11.96	2.00	2.65	2.45	.....
<i>b</i>	9.48	2.18	2.10	1.63	<i>h</i>	12.06	2.04	2.83	2.57	.....
<i>s</i>	9.25	1.79	1.80	1.25	<i>m</i>	12.40	2.18	3.07	2.88	2.21
<i>z</i>	10.19	2.67	2.77	2.20	<i>n</i>	12.75	2.67	3.45	3.16	2.52
Mean C....	.....	1.95	1.94	1.46	Mean C....	.....	2.22	3.00	2.76	2.36
Mean Mag.	9.39	9.39	9.39	9.39	Mean Mag.	12.29	12.29	12.29	12.29	12.58
<i>M</i> ₀.....	.....	7.44	7.45	7.93	<i>M</i> ₀.....	.....	10.07	9.29	9.53	10.22

TABLE 48.—5798 RU HERCULIS. MEAN MAGNITUDES.

6-INCH.											
Star.	July 31.		September 3.		September 4.		Mean.				
	Mag.	<i>Δ</i> Mag.	Mag.	<i>Δ</i> Mag.	Mag.	<i>Δ</i> Mag.	Mag. H.	Mag. P.	<i>Δ</i> Mag.		
<i>B</i>	6.57	−0.05	6.56	−0.06	6.73	+0.11	6.62	6.89	±0.07		
<i>C</i>	7.56	+0.03	7.53	0.00	7.49	−0.04	7.53	7.80	±0.02		
<i>l</i>	7.40	+0.01	7.44	+0.05	7.33	−0.06	7.39	7.66	±0.04		
Mean.....							7.18	7.45	±0.04		
<i>a</i>	8.63	−0.02	8.55	−0.10	8.77	+0.12	8.65	8.92	±0.08		
<i>b</i>	9.60	+0.12	9.46	−0.02	9.37	−0.11	9.48	9.75	±0.08		
<i>s</i>	9.38	+0.13	9.16	−0.09	9.21	−0.04	9.25	9.52	±0.09		
<i>z</i>	10.33	+0.14	10.09	−0.10	10.15	−0.04	10.19	10.46	±0.09		
Mean.....							9.39	9.66	±0.08		
12-INCH.											
Star.	August 11.		September 8.		September 9.		Mean.				
	Mag.	<i>Δ</i> Mag.	Mag.	<i>Δ</i> Mag.	Mag.	<i>Δ</i> Mag.	Mag. H.	Mag. P.	<i>Δ</i> Mag.		
<i>a</i>	8.53	−0.08	8.69	+0.08	8.61	0.00	8.61	8.88	±0.05		
<i>b</i>	9.55	−0.03	9.56	−0.02	9.62	+0.04	9.58	9.85	±0.03		
<i>s</i>	9.25	+0.04	9.18	−0.04	9.23	+0.01	9.22	9.49	±0.03		
<i>z</i>	10.22	+0.07	10.13	−0.02	10.11	−0.04	10.15	10.42	±0.04		
Mean.....							9.39	9.66	±0.04		
<i>e</i>	11.51	+0.12	11.30	−0.09	11.35	−0.04	11.39	11.66	±0.08		
<i>g</i>	12.08	+0.12	11.78	−0.18	12.03	+0.07	11.96	12.23	±0.12		
<i>h</i>	12.04	−0.02	12.05	−0.01	12.09	+0.03	12.06	12.33	±0.02		
<i>m</i>	12.55	+0.15	12.26	−0.14	12.40	0.00	12.40	12.67	±0.10		
<i>n</i>	12.78	+0.03	12.78	+0.03	12.69	−0.06	12.75	13.02	±0.04		
Mean.....							12.11	12.38	±0.07		
40-INCH.											
Star.	March 5.		March 15.		March 15.		May 2.		Mean.		
	Mag.	<i>Δ</i> Mag.	Mag.	<i>Δ</i> Mag.	Mag.	<i>Δ</i> Mag.	Mag.	<i>Δ</i> Mag.	Mag. H.	Mag. P.	<i>Δ</i> Mag.
<i>g</i> ...	12.07	+0.09	11.94	−0.04	11.93	−0.05	11.98	12.25	±0.06
<i>h</i> ...	12.11	0.00	12.12	+0.01	12.10	+0.01	12.11	12.38	±0.01
<i>m</i> ...	12.25	−0.11	12.36	0.00	12.43	+0.07	12.41	+0.06	12.36	12.63	±0.06
<i>n</i> ...	12.74	+0.01	12.74	+0.01	12.74	+0.01	12.69	−0.04	12.73	13.00	±0.02
Mean.....									12.30	12.57	±0.04
<i>p</i> ...	13.29	−0.13	13.45	+0.03	13.51	+0.09	13.42	13.69	±0.08
<i>t'</i> ...	15.31	+0.08	15.42	+0.19	14.97	−0.26	15.23	15.50	±0.18
<i>w'</i> ...	14.43	−0.25	14.75	+0.07	14.86	+0.18	14.69	+0.01	14.68	14.95	±0.13
Mean.....									14.44	14.71	±0.13

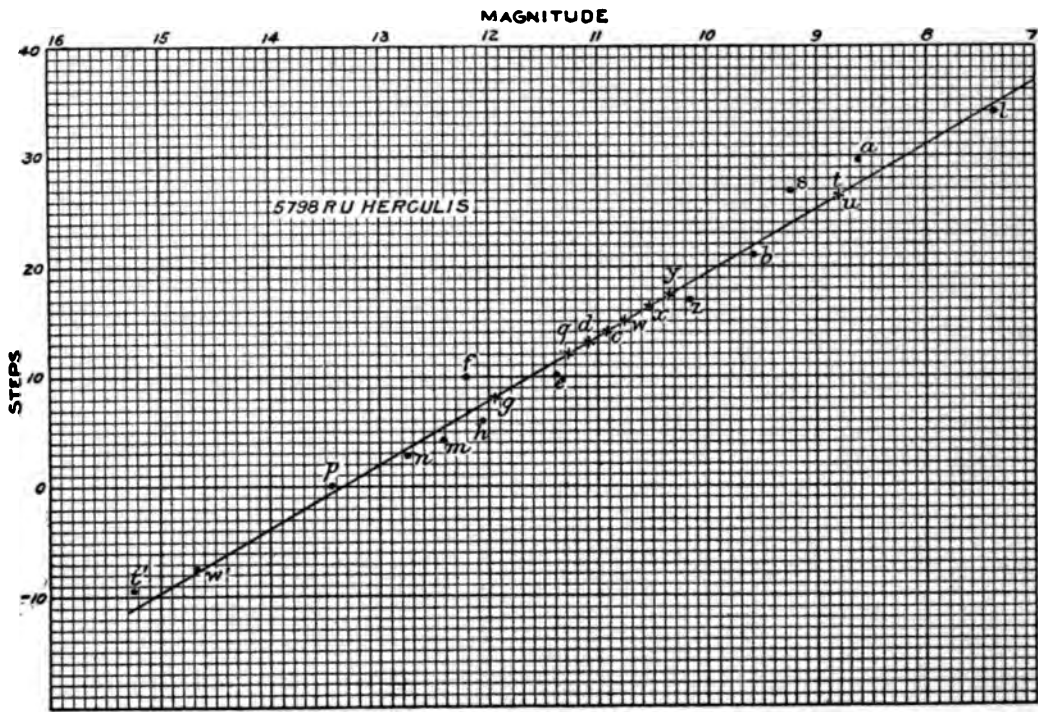


FIG. 16.—MAGNITUDE-CURVE FOR RU HERCULIS.

TABLE 49.—5798 RU HERCULIS VISUAL OBSERVATIONS OF THE VARIABLE.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
1	1897 Jan. 7	18	2410000+	40	6	a4v, v2b.	25.7, 23.0	24.3	9.17	good	0	-0.12
2	May 5	9	4050.63	150	6	{c1d, d1e, co-1f, fo-1g.} {g2h, h2-3v.}		3.5	12.75	good	117	+0.26
3	17	..	4062	150	6	e2f, f2h.		<6	<12	fair	...	...
4	25	..	4070	150	6	e1-2f, f2h.		<6	<12	good	...	...
5	June 7	9	4083.63	150	6	e3-4f, f1h.		<6	<12	good	...	...
6	20	9	4096.63	40	6	f1h±		<6	<12	good	...	...
7	25	9	4101.63	150	6	e3f, f1h.		<6	<12	good	...	...
8	July 5	9	4111.63	150	6	e1-2f, f1-2h.		<6	<12	fair	...	...
9	17	10	4123.67	80	6	e2f, f1h.		<6	<12	good	...	...
10	21	9	4127.63	150	6	{g2m, m2n, n3p.} {p1-2v, limit v.}		-1.5	13.7	good	194	+0.06
11	23	9	4129.63	80	6	p glimpsed, v not seen		<0	<13.3	good	...	...
12	Aug. 3	9	4140.63	150	6	v not seen, limit p		<0	<13.3	fair	...	...
13	13	9	4150.61	150	6	v not seen, limit n		<3	<12.8	poor	...	...
14	14	9	4151.61	150	6	v not seen, limit n		<3	<12.8	fair	...	...
15	20	9	4157.61	150	6	v not seen, limit p		<0	<13.3	good	...	...
16	Sept. 3	8	4171.58	150	6	v not seen, limit n		<3	<12.8	moon	...	...
17	12	8	4180.58	150	6	v not seen, limit m or n.		<3	<12.8	moon	...	...
18	13	7	4181.54	150	6	v not seen, limit i < n.		<2	<13.0	fair	...	...
19	14	8	4182.56	150	6	v not seen, limit p		<0	<13.3	good	...	...
20	21	8	4189.56	150	6	v suspected, vp?		<0	<13.3	good	...	...
21	25	8	4193.56	...	6	v not seen, limit 3 < n.		<0	<13.3	...	...	...
22	29	7	4197.54	...	6	v not seen, limit 3 < n.		<0	<13.3	...	...	...
23	Oct. 14	7	4212.54	150	6	p1v		-1.0	13.50	good	279	+0.81
24	23	7	4221.54	150	6	n2-3v, limit v		0.3	13.28	good	288	+0.88
25	29	6	4227.50	150	6	vn±, m1-2v, limit v.	2.8, 2.6	2.7	12.89	...	294	+0.61
26	Nov. 11	6	4240.50	150	6	m1v, v1n, g4-5v	3.1, 3.8, 3.5	3.4	12.77	fair	307	+0.74
27	16	6	4245.50	150	6	m1v, v1n	3.1, 3.8	3.4	12.77	good	312	+0.81
28	1898 Jan. 2	18	4293.00	150	6	m1v, v1n, g5-6v.	3.1, 3.8, 2.5	3.1	12.80	good	360	+1.50
29	18	18	4309.00	150	6	g3-4v, v1n.	4.5, 3.8	4.1	12.64	fair	376	+1.53
30	28	18	4319.00	150	6	v3g, d1-2v, q1v.	11.0, 11.6, 11.0	11.1	11.43	good	386	+0.53
31	Feb. 12	18	4333.98	40	6	r4x, v4d, a6-8v	20.4, 17.1, 22.7	20.0	9.92	good	401	-0.18
32	Mar. 2	17	4351.96	40	6	u3v, v1a, v4-5b, v8-10x.	23.5, 30.7, 25.5, 25.4	26.2	8.87	good	418	+0.12
33	23	17	4372.96	40	6	u4v, v2l, va, v1-2s, v4b.	{22.5, 28.7, 29.7} {28.4, 25.0}	26.0	8.90	good	440	+0.39
34	Apr. 1	16	4381.92	40	6	v1s, v2b, a3v, vl, u3-4v.	{27.9, 23.0, 26.7} {26.7, 23.0}	25.4	9.00	good	449	+0.50
35	11	9	4391.63	40	6	t3v, a4v, v0-1b, vs.	23.7, 25.7, 21.5, 26.9	24.4	9.16	good	458	+0.53
36	14	9	4394.63	40	6	{s2v, v2b, b4x, x5d.} {w2d, z4x, x3a.}	24.9, 23.0	23.9	9.25	fair	462	+0.52
37	25	6	4405.61	40	6	l6v, b2v, v3y, v5x, v6-8d.	{20.7, 19.0, 20.5} {21.4, 20.1}	20.3	9.87	good	473	+0.90
38	May 7	6	4417.63	40	6	{b5v, v4x, v2-3x.} {z2x, x2-3c, x3-4d.}	16.0, 20.4, 19.5	18.6	10.16	good	1	+0.83
39	11	10	4421.65	40	6	b5-6v, 20-1v, v1-2x, v4c.	15.5, 15.5, 17.9, 18.0	16.7	10.50	good	5	+1.08
40	16	9	4426.63	40	6	b6v, v2, v2x, v3w, x2w.	15.0, 17.0, 18.4, 18.0	17.1	10.41	fair	10	+0.84
41	23	9	4433.63	40	6	v2, v2x, v2-3c.	17.0, 18.4, 16.5	17.3	10.37	fair	17	+0.64
42	June 14	9	4435.63	80	12	v2g, e2v.	10.0, 8.1	9.0	11.80	fair	39	+1.39
43	July 5	10	4476.67	80	12	e3v, v1-2g.	7.1, 9.5	8.3	11.93	fair	60	+0.72
44	18	10	4489.67	80	12	g2v, v3m.	6.0, 7.1	6.5	12.25	poor	73	+0.62
45	26	10	4497.67	175	12	g2v, v3-4n.	6.0, 6.3	6.1	12.30	fair	81	+0.47
46	Aug. 8	10	4510.67	175	12	g2-3v, v1n, v6p.	5.5, 3.8, 6.0	5.1	12.46	good	94	+0.36
47	19	9	4521.63	80	12	g3v, vn v5-6p.	5.5, 3.8, 6.0	5.1	12.46	good	105	+0.11
48	27	9	4529.61	150	6	n3-4v, limit v, m2v.	-0.7, 2.1	0.7	13.21	poor	113	+0.78
49	Sept. 7	8	4540.58	150	6	m2-3v, n2v.	1.6, 0.8	1.2	13.15	fair	124	+0.65
50	Oct. 5	7	4568.54	150	6	n4v, p0-1v.	-1.2, -0.5	-0.8	13.47	fine	152	+0.50
51	Nov. 1	6	4595.50	150	6	v not seen, limit n.		<3	<12.8	fair	...	...
52	2	6	4596.50	...	6	v not seen, limit 1-2 < n.		<1	<13.2	good	...	...

TABLE 49.—5798 RU HERCULIS. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	<i>t</i> .	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
	1899		2410000+									
53	Jan. 8	18	4664.00	200	6	<i>v</i> suspected, limit 2-3 < <i>g</i>		< 5.5	< 12.4	fair	...	....
54	Jan. 10	18	4666.00	200	6	<i>p</i> 1 <i>v</i> , <i>n</i> 4-5 <i>v</i>	-1.0, -1.7.....	-1.3	13.58	good	250	+0.05
55	Feb. 15	17	4701.96	150	6	<i>f</i> 1 <i>v</i> , <i>v</i> 1 <i>g</i>	9.0, 9.0.....	9.0	11.80	good	286	-0.67
56	Mar. 4	17	4718.96	150	6	<i>v</i> 4 <i>g</i> , <i>c</i> 1 <i>v</i> , <i>d</i> 2 <i>v</i>	12.0, 13.0, 11.1.....	12.0	11.29	poor	303	-0.80
57	Mar. 19	17	4733.96	150	6	<i>v</i> 1 <i>g</i> , <i>d</i> 4-5 <i>v</i> , <i>c</i> 4 <i>v</i> , <i>v</i> 2 <i>f</i>	9.0, 8.6, 10.0, 12.0.....	9.9	11.67	good	318	-0.20
58	Apr. 4	15	4749.92	40	6	<i>v</i> 1 <i>d</i> , <i>x</i> 1-2 <i>v</i>	14.1, 15.4.....	14.4	10.87	good	334	-0.55
59	Apr. 16	15	4761.88	40	6	<i>v</i> 1-2 <i>d</i> , <i>x</i> 0-1 <i>v</i> , <i>z</i> 6-7 <i>v</i>	14.6, 15.9, 10.5.....	13.7	10.99	fair	346	-0.50
60	Apr. 28	9	4773.63	40	6	<i>v</i> 1 <i>d</i> , <i>x</i> 4-5 <i>v</i>	14.0, 11.9.....	12.9	11.12	fair	358	-0.20
61	May 4	9	4779.63	40	6	<i>v</i> 1 <i>d</i> , <i>v</i> 1, <i>z</i> 1-2 <i>v</i>	14.0, 16.4, 15.5.....	15.3	10.73	good	364	-0.56
62	May 18	9	4793.63	...	6	<i>v</i> 4 <i>d</i> , <i>v</i> 2-3 <i>x</i> , <i>z</i> 0-1 <i>v</i>	17.1, 18.9, 16.5.....	17.5	10.36	good	377	-0.74
63	May 29	9	4804.63	40	6	<i>v</i> 5 <i>z</i> , <i>b</i> 0-1 <i>v</i> , <i>s</i> 1 <i>v</i>	22.0, 20.5, 25.9.....	22.8	9.44	good	388	-1.44
64	June 3	9	4809.63	40	6	<i>u</i> 2 <i>v</i> , <i>v</i> 0-1 <i>a</i> , <i>v</i> 4 <i>b</i> , <i>v</i> 3 <i>s</i>	24.5, 30.2, 25.0, 29.9.....	27.4	8.65	good	393	-2.02
65	June 13	9	4819.63	40	6	{ <i>v</i> 3 <i>a</i> , <i>v</i> 5 <i>b</i> , <i>v</i> 4 <i>s</i> <i>l</i> 4-5 <i>v</i> , <i>u</i> 2-3 <i>t</i> }	32.7, 26.0, 30.9 { 29.9..... }	30.0	8.20	good	403	-1.66
66	June 19	9	4825.63	...	6	<i>l</i> 1 <i>v</i> , <i>v</i> 6 <i>a</i> , <i>v</i> 5 <i>u</i>	33.4, 35.7, 31.5.....	33.9	7.52	fair	409	-1.82
67	June 23	9	4829.63	...	6	<i>v</i> 2 <i>l</i> , <i>v</i> 6-8 <i>u</i>	36.4, 33.5.....	34.9	7.36	good	413	-1.64
68	July 8	9	4844.63	40	6	<i>l</i> 1 <i>v</i> , <i>v</i> 4, <i>v</i> 4-5 <i>u</i>	33.4, 29.7, 31.0.....	31.3	7.97	good	428	-0.51
69	July 17	9	4853.63	40	6	<i>l</i> 3-4 <i>v</i> , <i>v</i> 2 <i>u</i> , <i>v</i> 3-4 <i>a</i>	30.9, 28.0, 33.2.....	30.7	8.07	good	437	-0.33
70	July 29	9	4865.61	40	6	<i>l</i> 7-8 <i>v</i> , <i>v</i> 1 <i>u</i> , <i>v</i> 1-2 <i>a</i>	26.9, 27.5, 31.2.....	28.5	8.46	good	449	-0.04
71	Aug. 9	9	4876.61	40	6	<i>u</i> 2 <i>v</i> , <i>v</i> 4, <i>v</i> 8 <i>b</i>	24.5, 29.7, 24.0.....	26.0	8.90	fair	460	+0.21
72	Aug. 17	9	4884.61	...	6	<i>a</i> 2-3 <i>v</i> , <i>v</i> 5, <i>v</i> 1-2 <i>b</i>	27.2, 26.9, 22.5.....	25.5	8.98	good	468	+0.14
73	Aug. 26	8	4893.58	40	6	<i>a</i> 3 <i>v</i> , <i>v</i> 1 <i>b</i> , <i>v</i> 1 <i>s</i>	26.7, 22.0, 27.9.....	25.5	8.98	good	477	-0.11
74	Sept. 4	8	4902.58	...	6	<i>a</i> 5 <i>v</i> , <i>b</i> 1-2 <i>v</i> , <i>v</i> 6-7 <i>z</i> , <i>v</i> 1-2 <i>a</i>	24.7, 19.5, 23.5, 19.0.....	21.7	9.63	...	3	+0.24
75	Sept. 20	7	4918.54	40	6	<i>b</i> 4 <i>v</i> , <i>v</i> 4 <i>e</i> , <i>v</i> 5 <i>x</i> , <i>v</i> 4.....	17.0, 21.0, 21.4, 17.5.....	19.2	10.08	good	19	+0.28
76	Oct. 4	7	4932.54	40	6	<i>z</i> 1 <i>v</i> , <i>v</i> 1 <i>x</i> , <i>v</i> 4 <i>d</i>	16.0, 17.4, 17.1.....	16.8	10.48	fair	33	+0.21
77	Oct. 21	7	4949.54	40	6	<i>z</i> 4 <i>v</i> , <i>v</i> 1, <i>v</i> 2 <i>d</i>	13.0, 16.4, 15.1.....	14.8	10.63	fair	50	-0.27
78	Oct. 28	6	4956.50	40	6	<i>x</i> 2 <i>v</i> , <i>v</i> 0-1 <i>d</i> , <i>v</i> very red.....	14.4, 13.6.....	14.0	10.77	fair	57	-0.35
79	Nov. 6	6	4965.50	{ 40 150	6	<i>x</i> 3 <i>v</i> , <i>v</i> 1 <i>d</i>	13.4, 14.1.....	13.0	11.10	fair	66	-0.32
80	Nov. 22	6	4981.50	150	6	<i>d</i> 1 <i>v</i> , <i>v</i> 4-5 <i>g</i>	12.1, 12.5.....					
81	Dec. 14	18	5004.00	150	6	<i>d</i> 1-2 <i>v</i> , <i>v</i> 2 <i>g</i>	11.6, 10.0.....	10.8	11.49	low	82	-0.34
						<i>v</i> 2-3 <i>g</i>		10.5	11.53	fair	105	-0.69
	1900											
82	Jan. 7	17	5027.98	200	6	<i>g</i> 1 <i>v</i> , <i>v</i> m, <i>v</i> 1 <i>n</i>	7.0, 4.1, 3.8.....	4.6	12.57	good	129	+0.02
83	Jan. 26	15	5046.88	350	40	{ <i>g</i> 6 <i>v</i> , <i>v</i> 2 <i>m</i> , <i>v</i> 4 <i>n</i> <i>p</i> n, <i>u</i> 6-8 <i>w</i> ', <i>w</i> '6 <i>t</i> }	2.0, 6.1, 6.8.....	4.9	12.50	...	148	-0.38
84	Feb. 18	13	5069.79	350	40	<i>n</i> 3 <i>v</i> , <i>v</i> 2 <i>p</i>	-0.2, 2.0.....	0.9	13.20	fair	171	-0.17
85	Feb. 24	17	5075.96	80	12	<i>n</i> 3 <i>v</i> , <i>p</i> 1-2 <i>v</i> , limit <i>v</i>	-0.2, -1.5.....	-0.8	13.48	good	177	+0.02
86	Mar. 7	15	5086.88	275	12	<i>n</i> 6 <i>v</i> , <i>p</i> 1-2 <i>v</i> , <i>v</i> 4 <i>w</i> ', limit <i>w</i> '.....	-3.2, -1.5, -3.5.....	-2.7	13.80	good	188	+0.20
87	Mar. 21	11	5100.71	275	12	<i>n</i> 6 <i>v</i> , <i>p</i> 2 <i>v</i> , limit 2 < <i>v</i>	-3.2, -2.0.....	-2.6	13.78	fair	202	+0.05
88	Apr. 4	15	5114.88	275	12	<i>n</i> 3-4 <i>v</i> , <i>p</i> 2-3 <i>v</i> , <i>v</i> 6-8 <i>w</i> '.....	-0.7, -2.5, -0.5.....	-1.2	13.55	good	216	-0.25
89	Apr. 18	12	5128.75	275	12	<i>n</i> 6 <i>v</i> , <i>p</i> 5 <i>v</i>	-3.2, -5.0.....	-4.1	14.04	...	230	+0.27
90	May 1	10	5141.67	275	12	<i>n</i> 3-4 <i>v</i> , <i>v</i> < <i>p</i>		-0.7	13.47	poor	243	-0.18
91	May 24	9	5164.63	275	12	<i>n</i> 6 <i>v</i> , <i>p</i> 1 <i>v</i>	-3.2, -1.0.....	-2.1	13.71	good	266	+0.63
92	June 13	9	5184.63	350	40	<i>m</i> 1 <i>v</i> , <i>v</i> n, <i>v</i> 2 <i>p</i>	3.1, 2.8, 2.0.....	2.9	12.84	moon	286	+0.39
93	June 23	11	5194.71	150	6	<i>n</i> 1 <i>v</i> , limit <i>v</i>		1.8	13.01	fair	296	+0.79
94	July 21	9	5222.63	150	6	<i>n</i> 1 <i>v</i> ±.....		1.8	13.01	fair	324	+1.22
95	July 25	10	5226.67	80	12	<i>n</i> 1 <i>v</i> , <i>v</i> 2 <i>p</i>	1.8, 2.0.....	1.9	13.0	good	328	+1.3±
96	Aug. 14	9	5246.63	150	6	<i>n</i> 1-2 <i>v</i> , limit <i>v</i>		1.3	13.10	good	348	+1.63
97	Sept. 15	...	5278	150	6	<i>g</i> 4 <i>v</i> , <i>v</i> n, <i>m</i> 1 <i>v</i> , <i>v</i> 3 <i>p</i> ?.....	4.0, 2.8, 3.1, 3.0.....	3.2	12.79	good	379	+1.69
98	Oct. 26	7	5319.54	...	6	<i>v</i> 5-6 <i>x</i> , <i>v</i> 5 <i>z</i> , <i>s</i> 6 <i>v</i> , <i>b</i> 2-3 <i>v</i>	21.9, 22.0, 20.9, 18.5.....	20.5	9.83	good	420	+1.14
99	Nov. 21	6	5345.50	...	...	<i>b</i> 2-3 <i>v</i> , <i>v</i> 2-3 <i>x</i>	18.5, 18.9.....	18.7	10.13	poor	446	+1.65
	1902											
100	Mar. 5	14	5814.83	237	40	photometer.....		...	< 8.3	fair	433	....
101	Mar. 15	15	5824.88	237	40	photometer.....		...	7.75	fair	443	-0.68
102	Apr. 30	...	5870	...	6	photometer.....		...	9.2	...	5	-0.22
103	May 2	...	5872	237	40	photometer.....		...	9.02	...	7	-0.45
104	May 6	...	5876	...	6	photometer.....		...	9.48	...	11	-0.12
105	Oct. 7	7	6030.54	67	12	photometer.....		< 10	< 11.6	good	...	....

TABLE 49.—5798 RU HERCULIS. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	<i>t</i> .	<i>d</i> Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
106	1903 May 17	9	2410000+ 6252.63	67	12	<i>v</i> 2c±		16±	10.6±	fair	387	-0.3±
107	Oct. 11	7	6399.54	150	6	<i>v</i> 4g		12.0	11.28	good	51	+0.32
108	1904 May 14	13	6615.79	40	6	<i>g</i> 1v, <i>v</i> 1n	7.0, 3.8	5.4	12.40	good	268	-0.70
109	June 4	12	6636.74	24	24	photograph			12.3±			
110	6	12	6638.76	24	24	photograph			11.9±			
111	8	12	6640.74	24	24	photograph			11.37	good	292	-0.93
112	July 31	8	6693.58	40	6	photometer			11.21	good	345	-0.29
113	Aug. 2	9	6695.63	67	12	photometer			10.70	good	348	-0.77
114	11	9	6704.63	67	12	photometer			10.67	good	357	-0.65
115	13	9	6706.63	67	12	photometer			10.76	good	359	-0.49
116	26	8	6719.58	40	6	<i>z</i> 2v, <i>r</i> 4d	15.0, 17.1	16.0	10.60	moon	372	-0.60
117	Sept. 2	8	6726.58	67	12	photometer			9.75	good	379	-1.33
118	3	7	6727.54	40	6	photometer			9.62	good	380	-1.45
119	8	8	6732.58	67	12	photometer			9.22	fair	385	-1.73
120	8	..	..	24	24	photographs			9.5±	fair	385	..
121	9	..	6733	24	24	photographs			9.5	fair	386	-1.85
122	9	..	6733	67	12	photometer			9.5	fair	386	-1.85
123	Oct. 11	8	6765.58	40	6	<i>l</i> 4v, <i>r</i> 6a	30.0, 35.7	32.8	7.72	good	418	-1.04
124	1905 Jan. 12	18	6859.00	40	6	<i>b</i> 8v, <i>v</i> 2z	13.0, 19.0	17.5	10.35	fair	28	+0.27
125	Mar. 12	13	6917.77	237	40	<i>v</i> is 1½ to 2M> <i>g</i> ...						
126	26	13	6931.77	237	40	<i>g</i> 1v, <i>g</i> 5-6n	7.0, 8.3	7.4	12.08	fair	..	..
127	Apr. 1	12	6937.75	237	40	<i>g</i> 1v, <i>v</i> 5n	7.0, 7.8	7.2	12.10	fair	106	-0.26
128	22	10	6958.67	237	40	<i>g</i> 5v, <i>m</i> 1v, <i>v</i> 1n	3.0, 3.1, 3.8	3.4	12.75	good	127	+0.20
129	May 2	12	6968.75	237	40	<i>g</i> 3v, <i>v</i> n	5.0, 2.8	3.5	12.74	good	137	+0.12
130	20	10	6986.67	237	40	<i>n</i> 5v, <i>r</i> p, <i>r</i> 10-12w'	-2.2, 0.0, (3.5)	-0.7	13.46	good	155	+0.39
131	31	9	6997.63	200	6	<i>g</i> 8v, <i>n</i> 5v, <i>p</i> 0-1v	0.0, -2.2, -0.5	-0.8	13.48	fair	166	+0.17
132	June 20	11	7017.71	237	40	<i>n</i> 4v, <i>p</i> 2v, <i>r</i> 8-10w'	-1.2, -2.0, (1.5)	-1.6	13.60	good	186	0.00
133	24	9	7021.63	80	12	<i>v</i> not seen, limit <i>m</i> and <i>n</i>		<3±	<12.8	poor	..	..
134	26	10	7023.67	300	12	<i>n</i> 5v		-2.7	13.80	good	192	+0.13
135	July 4	10	7031.67	237	40	<i>n</i> 2-3v, <i>n</i> 8w'	0.3, 0.5	0.4	13.25	poor	200	-0.46
136	23	10	7050.67	237	40	<i>n</i> 2-3v, <i>v</i> 6-8w'	0.3, -0.5	-0.1	13.37	good	219	-0.42
137	Aug. 6	9	7064.63	237	40	<i>n</i> 4v, <i>r</i> 8w'	-1.2, 0.5	-0.6	13.45	fair	233	-0.27
138	19	9	7077.63	237	40	<i>r</i> 0-1n, <i>m</i> 2v	3.3, 2.1	2.7	12.88	good	246	-0.71
139	22	8	7080.58	237	40	<i>n</i> 1v, <i>m</i> 3v	1.8, 1.1	1.5	13.05	fair	249	-0.50
140	28	8	7086.59	150	6	<i>n</i> 2v, <i>v</i> near limit		0.8	13.20	fair	255	-0.23
141	Sept. 17	7	7106.54	150	6	<i>g</i> 1-2v, <i>v</i> 5-6n	6.5, 8.3	6.9	12.16	fair	275	-0.57
142	Oct. 20	7	7139.54	80	12	<i>g</i> 5v, <i>m</i> 1v, <i>v</i> 2n	3.0, 3.1, 4.8	3.8	12.69	good	308	+0.66
143	22	6	7141.50	237	40	<i>g</i> 3-4v, <i>v</i> 2m, <i>v</i> 4n	4.5, 6.1, 6.8	5.8	12.32	fair	310	+0.32

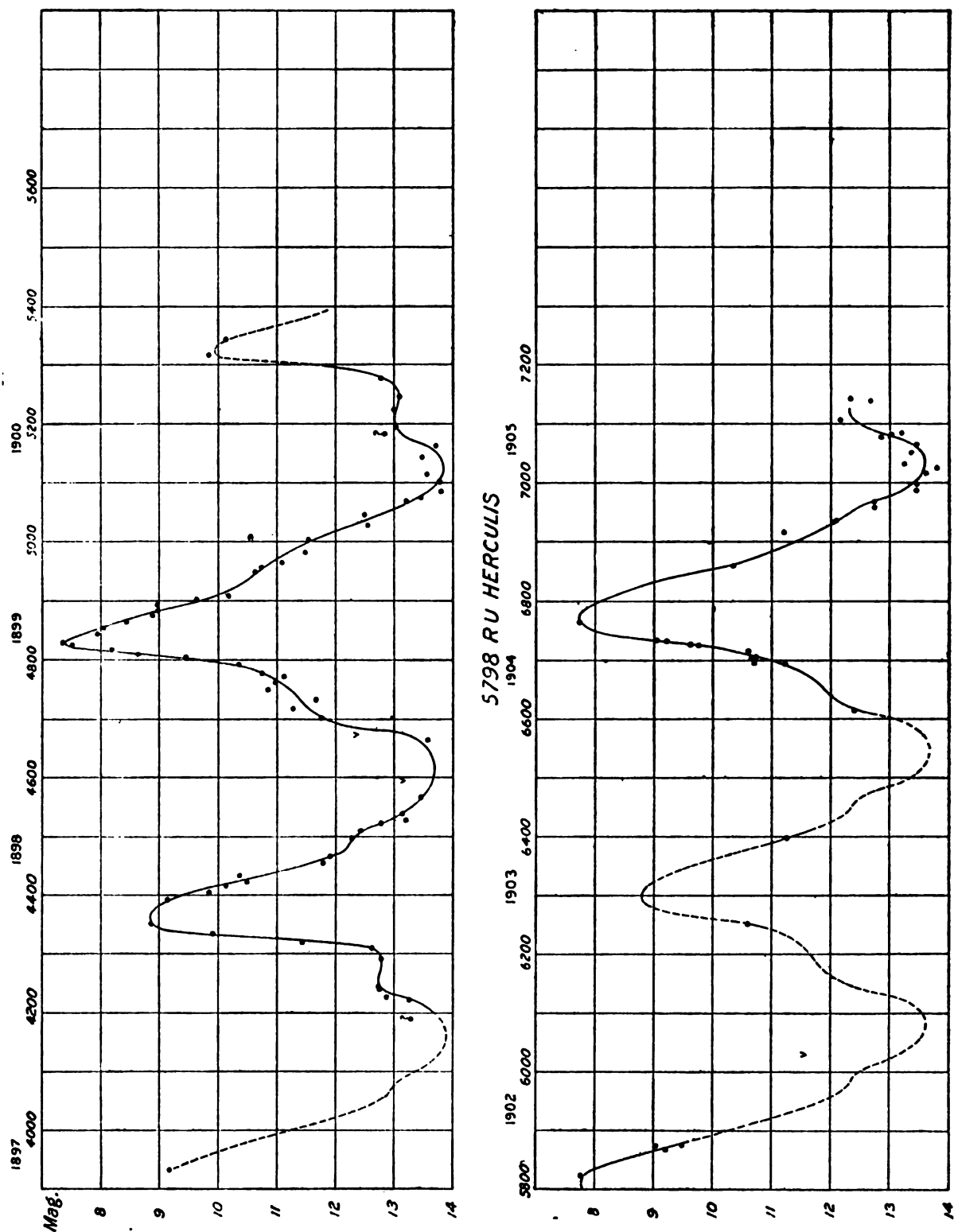


FIG. 17.—LIGHT-CURVE OF RU HERCULI.

TABLE 50.—5798 RU HERCULIS. MEAN MAGNITUDE FROM 40.25 DAY GROUPS.

Group No.	1	2	3	4	5	6	7	8	9	10	11	12	
J. D.	40	80	121	161	201	241	281	322	362	402	442	483	
3933 {	<i>t</i>	0	....	117	....	194	....	279	300	360	388	429	460
	<i>M</i>	9.17	....	12.75	....	13.7±	....	13.50	12.93	12.80	11.33	8.88	9.32
	ΔM	-0.12	....	+0.26	....	+0.06	....	+0.81	+0.76	+1.50	+0.63	+0.26	-0.61
	No.	1	....	1	....	1	....	1	4	1	3	2	4
4416 {	<i>t</i>	14	....	88	138	....	....	250	302	346	380	418	464
	<i>M</i>	10.65	....	12.49	13.31	....	....	13.58	11.59	10.99	9.80	7.82	8.83
	ΔM	+0.96	....	+0.57	+0.58	....	....	+0.05	-0.56	-0.42	-1.18	-1.19	+0.05
	No.	5	....	6	2	....	....	1	3	3	4	5	4
4899 {	<i>t</i>	18	58	94	138	179	216	254	291	333	379	420	446
	<i>M</i>	10.28	10.83	11.51	12.54	13.49	13.79	13.59	12.92	13.04	12.79	9.83	10.13
	ΔM	+0.24	-0.31	-0.52	-0.18	+0.02	+0.02	+0.22	+0.59	+1.38	+1.69	+1.14	+1.65
	No.	3	3	2	2	3	3	2	2	3	1	1	1
5382 {	<i>t</i>	....	....	....	....	....	....	....	....	....	....	433	443
	<i>M</i>	....	....	....	....	....	....	....	....	....	....	8.3±	7.75
	ΔM	....	....	....	....	....	....	....	....	....	....	....	-0.68
	No.	....	....	....	....	....	....	....	....	....	....	1	1
5865 {	<i>t</i>	8	....	....	....	....	....	....	....	....	....	....	....
	<i>M</i>	9.24	....	....	....	....	....	....	....	....	....	....	....
	ΔM	-0.26	....	....	....	....	....	....	....	....	....	....	....
	No.	3	....	....	....	....	....	....	....	....	....	....	....
6348 {	<i>t</i>	....	51	....	....	....	....	268	292	352	380	418	....
	<i>M</i>	....	11.28	....	....	....	....	12.40	11.37	10.58	9.65	7.72	....
	ΔM	....	+0.32	....	....	....	....	-0.70	-0.93	-0.55	-1.39	-1.04	....
	No.	....	1	....	....	....	....	1	1	4	5	1	....
6831 {	<i>t</i>	28	....	....	....	....	....	....	....	....	....	....	....
	<i>M</i>	10.35	....	....	....	....	....	....	....	....	....	....	....
	ΔM	+0.27	....	....	....	....	....	....	....	....	....	....	....
	No.	1	....	....	....	....	....	....	....	....	....	....	....
Means {	<i>t</i>	14	54	100	138	186	216	263	296	348	381	424	456
	<i>M</i>	9.61	11.06	12.25	12.62	13.60	13.79	13.27	12.19	11.71	11.03	8.56	8.63
	ΔM	+0.21	0.00	+0.10	+0.20	+0.04	+0.02	+0.10	+0.04	+0.48	-0.11	-0.21	+0.41
	No.	13	4	9	4	4	3	5	10	11	14	10	10

TABLE 51.—5798 RU HERCULIS. OBSERVED MAXIMA AND MINIMA.
Elements of maximum. 1898 March 6 (J. D. 2414355)+4834 E. *M* - *m* = 217⁴.

MAXIMA.							MINIMA.						
Epoch.	Date.		Mag.		Corr.	Wt.	Epoch.	Date.		Mag.		Corr.	Wt.
	Calendar.	J. D.	H.	P.				Calendar.	J. D.	H.	P.		
1	1898 Mar. 13	4362	8.85	9.12	+ 7	13	1	1897 Aug. 30	4167	13.90	14.17	+29	10
2	1899 June 23	4829	7.40	7.67	- 9	16	2	1898 Nov. 9	4603	13.70	13.97	-18	25
3	1900 Nov. 2	5326	9.77	10.04	+ 5	7	3	1900 Apr. 15	5125	13.86	14.13	+21	23
4	1902 Mar. 11	5820	....	mc	+10	2	5	1902 Nov. 26	6080	....	mc	+10	1
5	1903 June 28	6294	....	mc	+ 7	3	6	1904 Feb. 28	6540	13.7	14.0	-13	6
6	1904 Oct. 16	6770	....	7.97	0	12							

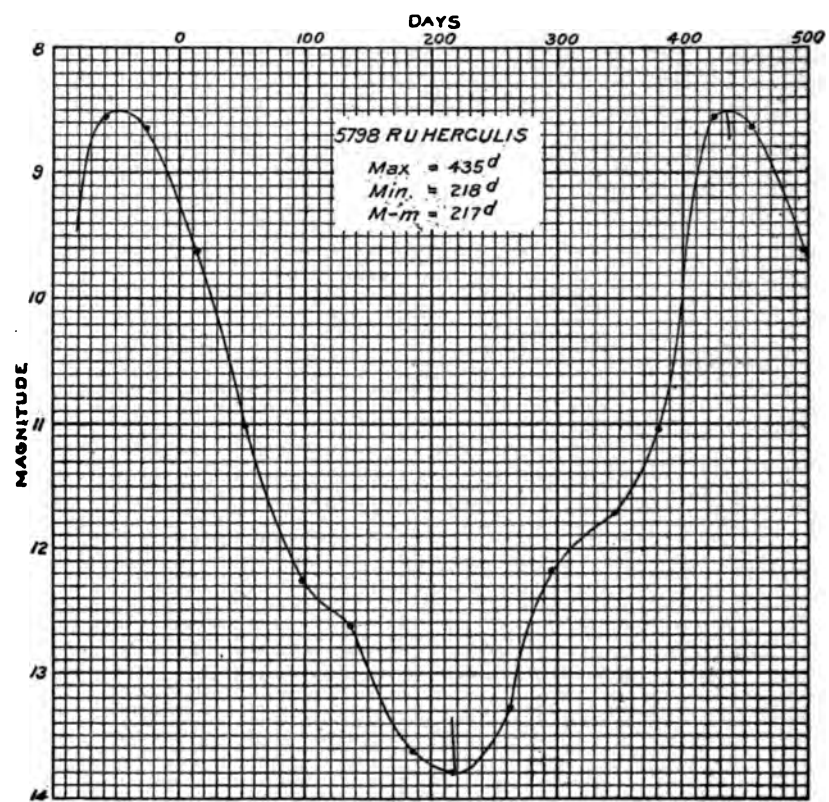


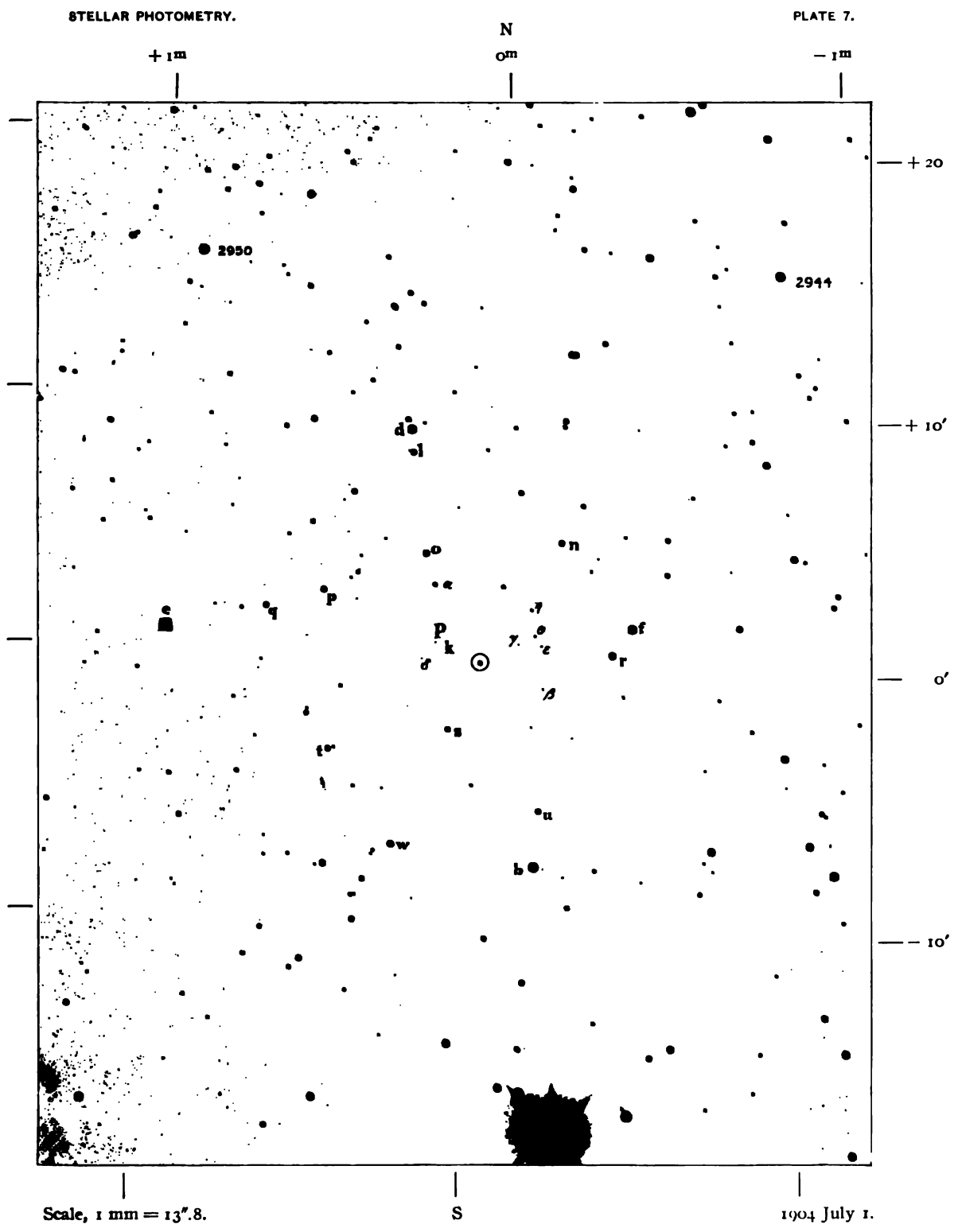
FIG. 18.—MEAN LIGHT-CURVE OF RU HERCULIS.

TABLE 54.—COMPARISON STARS FOR RV HERCULIS (IN ORDER OF RIGHT ASCENSION).

Star.	Coordinates from Variable.			Light Scale, Steps.	Magnitude.			
	R. A.		Dec.		Measured.		From Curve.	
					H.	P.	H.	P.
	"	s	"					
f	−346	−27.0	+ 92	37.2	10.86	11.1 ¹ ₂	.....	.....
r	−301	−23.5	+ 32	33.3	11.67	11.9 ²	.....	.....
n	−184	−14.4	+283	.....	.....	.....	.....	.....
u	−150	−11.7	−332	35.8	12.28	12.5 ³	.....	.....
p	−147	−11.5	− 52	10.0	14.75	15.0 ⁰	.....	.....
b	−146	−11.4	−461	44.6	9.89	10.14	.....	.....
e	−137	−10.7	+ 46	.....	.....	.....	.....	.....
θ	−122	− 9.5	+ 69	.....	.....	.....	.....	.....
v	−113	− 8.8	+128	15.7	14.26	14.5 ¹	.....	.....
γ	− 86	− 6.7	+ 49	.....	.....	.....	.....	.....
m	− 76	− 5.9	+396	.....	.....	.....	.....	.....
s	− 67	− 5.2	−154	27.3	12.67	12.92	.....	.....
k	+ 88	+ 6.9	+ 35	8.5	15.50	15.75	.....	.....
P	+104	+ 8.2	+ 44	14.5	14.95	15.20	.....	.....
a	+113	+ 8.8	+176	.....	.....	.....	.....	.....
δ	+133	+10.4	+ 4	11.4	15.22	15.47	.....	.....
o	+133	+10.4	+247	33.4	11.46	11.71	.....	.....
l	+176	+13.7	+475	25.3	.....	.....	13.0±	13.3±
d	+181	+14.4	+527	39.8	10.67	10.92	.....	.....
w	+186	+14.5	−422	.....	.....	.....	11.0±	11.3±
x	+340	+26.6	−475	.....	.....	.....	12.0±	12.3±
p	+366	+28.6	+151	30.3	.....	.....	12.25	12.50
t	+344	+26.9	−212	26.0	.....	.....	12.91	13.16
q	+498	+38.9	+111	35.0	.....	.....	11.48	11.73
e	+727	+56.8	+ 56	51.2	8.86	9.11	.....	.....

TABLE 55.—6100 RV HERCULIS. PHOTOMETER MEASURES OF COMPARISON STARS.

1904 July 31.			6-INCH.				Fine.	
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
h m 17 38	13	F ₀₁	8.0 9.3 8.9	8.70	9.89	0.27	7.14	7.39
		e	21.0 21.4 21.2	21.20	22.22	1.85	8.72	8.97
		d	40.8 41.3 41.1	41.07	40.64	3.91	10.78	11.03
		f	44.2 43.7 44.1	44.00	43.40	4.14	11.01	11.26
		b	31.9 31.2 31.2	31.43	31.72	2.89	9.76	10.01
		B	14.0 14.5 13.8	14.10	14.35	0.83	7.70	7.95
		B ₀₁	19.0 19.3 18.3	18.87	19.32	1.51	8.38	8.63
		G ₀₁	9.8 9.2 10.0	9.67	10.02	0.29	7.16	7.41
		G ₀	10.7 9.8 10.6	10.37	.....	.....	.....	.....
		B ₀₁	19.2 19.9 20.2	19.77	.....	.....	.....	.....
	15	B	15.0 14.2 14.6	14.60	.....	.....	.....	.....
		b	31.7 32.3 32.1	32.03	.....	.....	.....	.....
		f	43.0 42.2 43.2	42.80	.....	.....	.....	.....
		d	39.2 40.8 40.6	40.20	.....	.....	.....	.....
		e	23.7 23.3 22.7	23.23	.....	.....	.....	.....
	18	F ₀₁	11.1 11.2 10.9	11.07	.....	.....	.....	.....



6100 RV HERCULIS.
 R. A. 16^h 56^m 44^s.7. Dec. +31° 22' 18", 1900.

TABLE 55.—6100 RV HERCULIS. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1904 September 4.			6-INCH.				Fair, quiet, dull.		
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.		
				Mean of 3.	Mean of 6.		H.	P.	
<i>h m</i>	<i>°</i>								
19 26	32	<i>F</i> _{at}	9.1 10.1 10.1	9.77	10.80	0.37	7.05	7.30	
		<i>e</i>	23.9 24.1 24.4	24.13	25.23	2.16	8.84	9.09	
		<i>d</i>	44.9 43.4 44.2	44.17	45.19	4.31	10.99	11.24	
		<i>f</i>	45.8 46.1 45.1	45.67	45.32	4.32	11.00	11.25	
	34	<i>b</i>	32.5 31.6 31.4	31.83	31.88	2.91	9.59	9.84	
	35	<i>B</i>	15.9 16.1 15.1	15.70	15.89	1.07	7.75	8.00	
	33	<i>G</i> _{at}	11.7 11.9 11.6	11.73	11.78	0.48	7.16	7.41	
		<i>G</i> _{at}	12.1 11.2 12.2	11.83	.....	.....	.....	.....
	36	<i>B</i>	16.3 15.9 16.0	16.07	.....	.....	.....	.....
	35	<i>b</i>	32.1 31.5 32.2	31.93	.....	.....	.....	.....
		<i>f</i>	45.4 44.3 45.2	44.97	.....	.....	.....	.....
		<i>d</i>	46.1 46.2 46.3	46.20	.....	.....	.....	.....
		<i>e</i>	26.2 26.7 26.1	26.33	.....	.....	.....	.....
19 45	36	<i>F</i> _{at}	11.7 11.9 11.9	11.83	.....	.....	.....	.....
1904 September 5.			Good, somewhat dull.						
18 40	24	<i>F</i> _{at}	9.2 9.7 9.0	9.30	9.79	0.28	7.18	7.43	
		<i>e</i>	22.0 22.3 22.9	22.40	22.29	1.86	8.76	9.01	
		<i>d</i>	40.9 41.3 41.5	41.23	40.85	3.93	10.83	11.08	
		<i>f</i>	43.1 43.2 42.5	42.93	42.83	4.11	11.01	11.26	
	26	<i>b</i>	29.7 29.9 29.8	29.80	29.30	2.62	9.52	9.77	
	27	<i>B</i>	13.3 14.0 13.9	13.73	13.57	0.73	7.63	7.88	
	27	<i>G</i> _{at}	9.3 9.9 9.3	9.50	9.75	0.26	7.16	7.41	
		<i>G</i> _{at}	10.0 9.8 10.2	10.00	.....	.....	.....	.....
	28	<i>B</i>	13.5 13.3 13.4	13.40	.....	.....	.....	.....
	28	<i>b</i>	29.0 28.6 28.8	28.80	.....	.....	.....	.....
		<i>f</i>	42.3 43.0 42.9	42.73	.....	.....	.....	.....
		<i>d</i>	39.8 40.7 40.9	40.47	.....	.....	.....	.....
		<i>e</i>	21.9 22.4 22.2	22.17	.....	.....	.....	.....
19 1	28	<i>F</i> _{at}	10.5 10.2 10.1	10.27	.....	.....	.....	.....
1904 August 11.			12-INCH.				Good.		
18 42	23	<i>b</i>	27.5 27.5 26.6	27.20	27.99	2.45	9.85	10.09	
		<i>u</i>	52.4 51.5 52.5	52.13	51.67	4.96	12.36	12.60	
		<i>r</i>	43.2 44.3 43.7	43.73	44.31	4.25	11.65	11.89	
		<i>f</i>	36.7 37.1 37.2	37.00	37.64	3.50	10.90	11.14	
		<i>s</i>	55.9 57.0 56.4	56.43	56.95	5.35	12.75	12.99	
		<i>o</i>	41.9 42.2 43.0	42.37	42.75	4.07	11.47	11.71	
		<i>d</i>	35.9 36.7 36.1	36.23	36.03	3.31	10.71	10.95	
18 53	25	<i>e</i>	18.2 17.6 17.4	17.73	17.83	1.43	8.83	9.07	
19 7	28	<i>e</i>	18.2 18.1 17.5	17.93	.....	.....	.....	.....
		<i>d</i>	35.9 35.9 35.7	35.83	.....	.....	.....	.....
		<i>o</i>	42.9 43.3 43.2	43.13	.....	.....	.....	.....
		<i>s</i>	57.5 57.7 57.2	57.47	.....	.....	.....	.....
		<i>f</i>	37.7 38.9 38.2	38.27	.....	.....	.....	.....
		<i>r</i>	44.0 45.5 44.9	44.80	.....	.....	.....	.....
		<i>u</i>	51.3 51.2 51.1	51.20	.....	.....	.....	.....
19 18	29	<i>b</i>	29.3 28.2 28.8	28.77	.....	.....	.....	.....

TABLE 55.—6100 RV HERCULIS. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1904 August 13.			12-INCH.				Good.	
Sideral Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
h m 19 38	33	b	31.3 32.5 32.4	32.07	32.60	2.93	9.95	10.19
		u	56.7 56.1 55.9	56.23	56.72	5.33	12.35	12.59
		r	49.0 48.4 49.7	49.03	48.53	4.67	11.69	11.93
		f	42.5 41.6 42.2	42.10	41.22	3.91	10.93	11.17
		s	60.1 59.0 58.7	59.27	59.15	5.45	12.47	12.71
		o	45.8 46.5 48.0	46.77	46.00	4.42	11.44	11.68
		d	40.0 40.1 39.6	39.90	38.94	3.65	10.67	10.91
		e	20.1 20.3 19.2	19.87	20.07	1.72	8.74	8.98
		e	20.4 19.8 20.6	20.27	.....	.....	.....	.....
		d	37.1 38.3 38.5	37.97	.....	.....	.....	.....
		o	44.8 45.9 45.0	45.23	.....	.....	.....	.....
		s	57.6 59.2 60.3	59.03	.....	.....	.....	.....
		f	39.9 40.9 40.2	40.33	.....	.....	.....	.....
		r	47.0 48.9 48.2	48.03	.....	.....	.....	.....
		u	57.8 56.8 57.0	57.20	.....	.....	.....	.....
		b	33.0 32.8 33.6	33.13	.....	.....	.....	.....
19 58	37	b	33.0 32.8 33.6	33.13	.....	.....	.....	.....
1904 September 8.			Quiet, dull, fair to good.					
20 35	44	b	20.1 20.9 20.7	20.57	21.60	1.88	9.88	10.12
		u	41.9 42.6 41.8	42.10	43.24	4.13	12.13	12.37
		r	38.6 39.2 38.4	38.73	39.13	3.68	11.68	11.92
		f	29.8 30.7 30.2	30.23	31.07	2.76	10.76	11.00
		s	48.3 48.1 48.2	48.20	49.29	4.78	12.78	13.02
		o	37.3 37.2 38.0	37.50	37.32	3.46	11.46	11.70
		d	29.7 29.4 29.8	29.63	29.80	2.63	10.63	10.87
		e	14.0 14.7 15.0	14.57	14.72	1.01	9.01	9.25
		e	15.2 14.4 15.0	14.87	.....	.....	.....	.....
		d	30.5 29.2 30.2	29.97	.....	.....	.....	.....
		o	36.2 37.3 38.0	37.17	.....	.....	.....	.....
		s	51.1 50.2 49.8	50.37	.....	.....	.....	.....
		f	30.8 32.8 32.1	31.90	.....	.....	.....	.....
		r	38.5 40.6 39.5	39.53	.....	.....	.....	.....
		u	45.0 44.1 44.0	44.37	.....	.....	.....	.....
		b	22.9 22.9 22.1	22.63	.....	.....	.....	.....
21 0		b	22.9 22.9 22.1	22.63	.....	.....	.....	.....
1900 June 8.			40-INCH, WEDGE II.					
12 45		P	50.9 46.8 47.2 48.1	48.25	.....	4.82	14.87	15.12
		s	28.1 28.1 26.2 29.5	27.98	.....	2.62	12.67	12.92
		β	47.1 44.3 46.5 44.6	45.63	.....	4.57	14.62	14.87
		η	40.9 41.7 40.0 42.3	41.23	.....	4.07	14.12	14.37
13 15		r	21.0 20.2 20.8 21.5	20.88	.....	1.63	11.68	11.93
1900 July 12.								
		s	27.0 24.0 26.0 29.3	26.58	.....	2.45	12.52	12.77
		v	24.4 24.1 23.9 25.0	24.35	.....	2.14	12.21	12.46
		η	44.0 43.9 41.8 43.7	43.35	.....	4.32	14.39	14.64
		f	12.5 13.8 15.2 14.1	13.90	.....	0.52	10.59	10.84
		r	22.4 21.1 21.7 20.9	21.53	.....	1.74	11.81	12.06
		a	32.2 32.0 32.2 34.2	32.65	.....	3.15	13.22	13.47
		o	20.4 20.8 22.8 20.0	21.00	.....	1.67	11.74	11.99
18 45		o	20.4 20.8 22.8 20.0	21.00	.....	1.67	11.74	11.99

TABLE 55.—6100 RV HERCULIS. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1900 August 30.		40-INCH, WEDGE II.						
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
<i>h m</i> 19 6		<i>f</i>	8.0 14.2 13.2	11.80	13.30	0.45	10.64	10.89
		<i>r</i>	23.4 22.5 23.0	22.97	21.12	1.70	11.89	12.14
		<i>s</i>	26.5 27.5 26.3	26.77	26.62	2.47	12.66	12.91
		<i>δ</i>	55.5 54.4 53.5	54.47	53.65	5.23	15.42	15.67
		<i>P</i>	51.3 50.9 50.7	50.97	50.45	5.02	15.21	15.46
		<i>k</i>	57.3 57.8 59.1	58.07	56.57	5.45	15.64	15.89
		<i>β</i>	45.8 48.2 48.0	47.33	47.22	4.73	14.92	15.17
		<i>γ</i>	45.0 44.8 44.2	44.67	43.59	4.35	14.54	14.79
		<i>θ</i>	53.8 53.2 50.9	52.63	.....	5.17	15.36	15.61
		<i>η</i>	41.8 43.5 42.2	42.50	.....	.....	.....	.....
		<i>β</i>	46.1 48.2 47.0	47.10	.....	.....	.....	.....
		<i>k</i>	53.1 55.2 56.9	55.07	.....	.....	.....	.....
		<i>P</i>	50.8 48.8 50.2	49.93	.....	.....	.....	.....
		<i>δ</i>	52.6 52.9 53.0	52.83	.....	.....	.....	.....
		<i>s</i>	27.3 26.5 25.6	26.47	.....	.....	.....	.....
		<i>r</i>	18.1 18.6 21.0	19.27	.....	.....	.....	.....
19 46		<i>f</i>	12.9 16.5 15.0	14.80	.....	.....	.....	.....
1900 September 13.		Air quiet, seeing good.						
19 6		<i>u</i>	23.8 24.4 22.0	23.40	24.57	2.18	12.15	12.40
		<i>s</i>	26.2 27.1 27.3	26.87	28.07	2.64	12.61	12.86
		<i>f</i>	15.8 16.8 16.8	16.47	17.02	1.03	11.00	11.25
		<i>r</i>	20.8 21.5 22.2	21.50	22.17	1.83	11.80	12.05
		<i>β</i>	46.1 46.2 47.1	46.47	47.49	4.75	14.72	14.97
		<i>ε</i>	48.2	48.2	.....	4.8±	14.8±	15.0±
		<i>θ</i>	49.2	49.2	.....	4.9±	14.9±	15.1±
		<i>γ</i>	40.5 41.5 39.5	40.50	40.50	4.00	13.97	14.22
		<i>α</i>	31.0 32.2 33.2	32.13	32.01	3.10	13.07	13.32
		<i>ο</i>	20.0 18.8 20.0	19.60	19.51	1.43	11.40	11.65
		<i>δ</i>	48.5 51.9 53.2	50.90	50.75	5.04	15.01	15.26
		<i>P</i>	46.8 46.2 47.5	46.83	47.93	4.80	14.77	15.02
		<i>k</i>	54.9 57.0 55.1	55.67	.....	5.40	15.37	15.62
		<i>P</i>	48.9 49.9 48.3	49.03	.....	.....	.....	.....
		<i>δ</i>	50.2 50.4 51.2	50.60	.....	.....	.....	.....
		<i>v</i>	45.9 46.0 48.8	46.90	.....	4.70	14.67	14.92
		<i>ο</i>	20.1 18.2 20.0	19.43	.....	.....	.....	.....
		<i>α</i>	31.9 31.5 32.3	31.90	.....	.....	.....	.....
		<i>η</i>	40.2 40.3 41.0	40.50	.....	.....	.....	.....
19 45		<i>β</i>	48.1 48.9 48.5	48.50	.....	.....	.....	.....
		<i>r</i>	21.5 23.9 23.1	22.83	.....	.....	.....	.....
		<i>f</i>	18.9 17.6 16.2	17.57	.....	.....	.....	.....
		<i>s</i>	30.0 28.8 29.0	29.27	.....	.....	.....	.....
		<i>u</i>	25.5 26.5 25.2	25.73	.....	.....	.....	.....

TABLE 56.—6100 RV HERCULIS. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

6-INCH.															
Star.	1904 July 31.					1904 September 4.					1904 September 5.				
	C.	Obs. Mag.		Δ Mag.		C.	Obs. Mag.		Δ Mag.		C.	Obs. Mag.		Δ Mag.	
		H.	P.	H.	P.		H.	P.	H.	P.		H.	P.	H.	P.
B.....	0.80	7.67	7.92	+ .16	.00	1.07	7.75	8.00	+ .24	+.08	0.73	7.63	7.88	+ .12	-.04
F.....	-0.48	6.39	6.64	+ .05	+.02	-0.38	6.30	6.55	-.04	-.07	-0.47	6.43	6.68	+ .09	+.06
G.....	-0.46	6.41	6.66	-.20	.00	-0.27	6.41	6.66	-.20	.00	-0.49	6.41	6.66	-.20	.00
Means.	-0.05	6.82	7.07	± .14	± .01	0.14	6.82	7.07	± .16	± .05	-0.08	6.82	7.07	± .14	± .03
M.....	....	6.87	7.12	...	...	....	6.68	6.93	...	...	....	6.90	7.15	...	...

12-INCH.					40-INCH.					
Star.	Mag. 6-inch.	C.			Star.	Mag. 12-inch.	C.			
		Aug. 11.	Aug. 13.	Sept. 8.			June 8.	July 12.	Aug. 30.	Sept. 13.
b.....	9.62	2.45	2.93	1.88	f.....	10.86	....	0.52	0.45	1.03
d.....	10.87	3.31	3.65	2.63	o.....	11.46	....	1.67	....	....
e.....	8.77	1.43	1.72	1.01	r.....	11.67	1.63	1.74	1.70	1.83
f.....	11.01	3.50	3.91	2.76	s.....	12.67	2.62	2.45	2.47	2.64
					u.....	12.28	....	....	....	2.18
Mean C.....	....	2.67	3.05	2.07	Mean C ..	....	2.12	1.60	1.54	1.92
Mean Mag. ...	10.07	10.07	10.07	10.07	Mean Mag	....	12.17	11.67	11.73	11.87
M.....	....	7.40	7.02	8.00	M.....	....	10.05	10.07	10.19	9.95

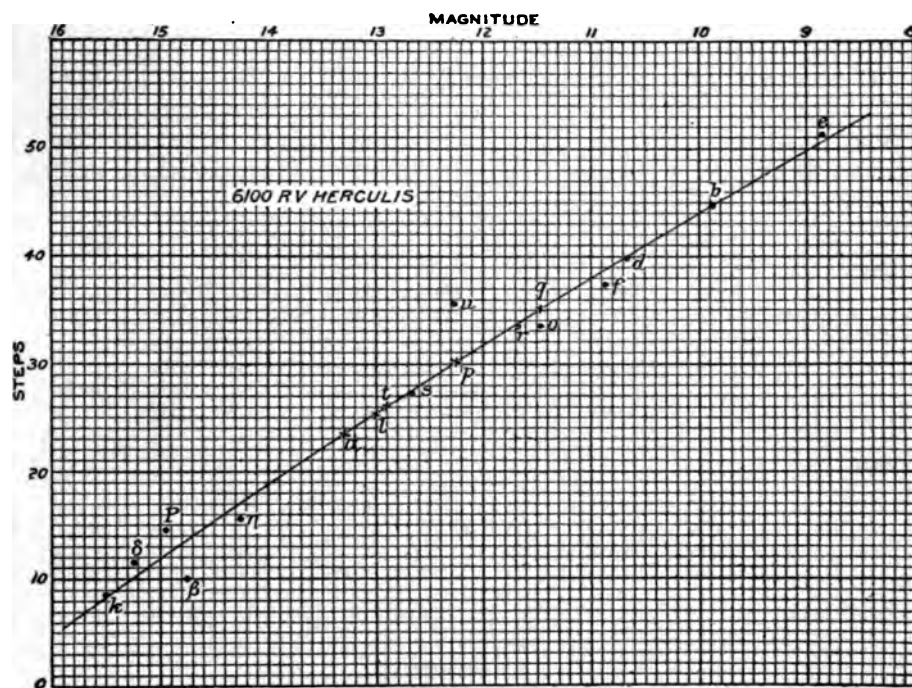


FIG. 19.—MAGNITUDE-CURVE FOR RV HERCULIS.

TABLE 58.—6100 RV HERCULIS. VISUAL OBSERVATIONS OF THE VARIABLE.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
1	1897 Aug. 23	9	2410000+ 4160.63	80	6	v1d, b2-3v.....	40.8, 42.1.....	41.4	10.40	poor	0	-0.13
2	24	9	4161.63	150	6	b3v, v1-2d.....	41.6, 41.3.....	40.4	10.57	good	1	+0.01
				80	6	v1f, b4v, v0-1d.....	40.6, 40.3, 38.2.....					
				80	6	v1d, v2f, f40, o2p.....	38.7, 41.6.....					
				80	6	pw, px, q1u.....	.....				
				80	6	u2s, st, qr, r2m.....	.....				
3	Sept. 27	8	4164.63	150	6	mn, s2l, limit l.....	.....	39.5	10.75	good	4	+0.18
				150	6	b4v, d1v, v2f.....	40.6, 38.8, 39.2.....					
				150	6	b5v, d2v, v40, v2f.....	39.6, 37.8, 37.4, 39.2.....					
				80	6	d2v, v2f, v2-30.....	37.8, 39.2, 35.9.....					
				150	6	d2v, v0-1f, v30.....	37.8, 37.7, 36.4.....					
				150	6	d4v, f2v, v30.....	35.8, 35.2, 36.4.....					
				150	6	f4v, v0-10, v4p.....	33.2, 33.9, 34.3.....					
				150	6	r2v, o3v, v1p.....	31.3, 30.4, 31.3.....					
				150	6	r6v, o4v, p1v.....	27.3, 29.4, 29.3.....					
				150	6	v1-2s, o2f, limit 2 < t.....	28.8.....					
11	22	7	4190.54	150	6	p2v, v2s, limit 3-4 < s.....	28.3, 29.3.....	28.8	12.49	good	30	+1.47
12	25	8	4193.56	150	6	o6v, p4v, vs, v2f.....	27.4, 26.3, 27.3.....	27.0	12.77	good	33	+1.67
13	28	8	4196.58	150	6	s1-2v, limit v.....	.....	25.8	12.96	good	36	+1.78
14	Oct. 1	8	4199.58	150	6	s2v, vt.....	25.3, 26.0.....	25.6	12.98	good	39	+1.71
15	13	7	4211.54	150	6	v not seen, limit u.....	.....	<36	<12.3	good	...	...
16	14	7	4212.54	150	6	v not seen, limit 3 < s.....	.....	<24	<13.2	good	...	...
17	25	6	4223.50	150	6	v not seen, limit 1 < s.....	.....	<26	<12.9	good	...	...
18	29	6	4227.50	150	6	v not seen, limit 2 < s.....	.....	<25	<13.1	good	...	...
19	Nov. 11	6	4240.50	150	6	v not seen, limit s.....	.....	<27	<12.8	good	...	...
20	16	6	4245.50	150	6	v not seen, limit 1 < s.....	.....	<26	<12.9	fine	...	...
21	Dec. 29	6	4288.50	150	6	v not seen, limit b.....	.....	<44	<10	low	...	...
22	31	18	4291.00	150	6	v not seen, limit u.....	.....	...	<12.3	good	...	...
23	1898 Jan. 18	18	4309.00	150	6	s2v ?, limit v ?.....	.....	25.3	13.01	fair	149	-0.28
24	28	18	4319.00	150	6	f1-2v, v0, v3s.....	35.7, 33.4, 30.3.....	33.1	11.79	good	159	-0.89
25	Feb. 12	18	4334.00	150	6	v1f.....	.....	38.2	10.97	fair	174	-0.40
26	15	17	4336.96	150	6	v0-1f, d3-4v.....	37.7, 36.3.....	37.0	11.17	good	176	-0.02
27	24	18	4345.98	150	6	v1f, b6v, d1-2v.....	37.2, 38.6, 38.3.....	38.0	11.00	good	185	+0.24
28	Mar. 2	17	4351.96	150	6	v2f, b6v, v1-2d.....	39.2, 38.6, 41.3.....	39.7	10.73	good	191	+0.12
29	23	17	4372.96	40	6	b4v, v1d, v4f.....	40.6, 40.8, 41.2.....	40.8	10.53	good	12	-0.16
30	Apr. 1	16	4381.92	40	6	d1v, v1f, v30, b5v.....	38.8, 37.2, 36.4, 39.6.....	38.0	11.00	good	21	+0.18
31	11	9	4391.63	150	6	o1v, f3v, v1r.....	32.4, 34.2, 34.3.....	33.6	11.70	fair	31	+0.66
32	15	16	4395.92	150	6	o1v, v1p, f3v, v2r.....	32.4, 30.3, 34.2, 35.3.....	33.0	11.80	good	35	+0.65
33	26	9	4406.63	150	6	r4v, v2s, u1v.....	29.3, 29.3, 34.8.....	31.1	12.10	good	46	+0.65
34	May 7	9	4417.63	150	6	s3v, f1v, limit v.....	24.3, 25.0.....	24.6	13.13	fine	57	+1.33
35	June 13	..	4454	..	12	v not seen, limit 8-10 < s.....	.....	<18	<14.1	good	94	...
36	13	..	4454	..	24	v not seen, limit 2M < s.....	.....	...	<14.7	good	94	...
37	21	12	4462.75	..	12	vk.....	.....	9.5	15±	...	102	+0.8±
38	25	12	4466.75	275	12	v seen, limit 2M < s.....	.....	...	14.7±	fair	106	+0.3±
39	July 6	10	4477.67	80	12	v suspected, s 3-4v ?.....	.....	23.8	13.27	moon	117	...
40	7	13	4478.79	..	40	P2v, v3-4k.....	12.5, 12.0.....	12.2	14.97	...	118	+0.50
41	July 21	10	4492.67	..	8	v not seen, limit 6 < s.....	.....	<21	<13.7	good	132	...
42	23	10	4494.65	..	12	v is 1½M < s.....	.....	...	14.2±	good	134	+0.1±
43	Aug. 8	10	4510.67	..	12	s3-4v.....	.....	23.8	13.28	good	150	+0.03
44	18	10	4520.67	80	12	v20, r3v, f4v.....	35.4, 30.3, 33.2.....	32.9	11.82	good	160	-0.68
45	22	9	4524.63	80	12	v8s, v2-3r, ov, f5-6v.....	35.3, 35.8, 33.4, 31.7.....	34.0	11.67	...	164	-0.38
46	24	10	4526.65	175	12	s10a±.....	.....	...	...	fair	...	...
47	27	9	4529.65	150	6	v2r, f3v, v10, d4v.....	35.3, 34.2, 34.4, 35.8.....	34.4	11.58	good	169	-0.15
48	Sept. 2	9	4535.61	150	6	f2v, v3r, d4v, v30.....	35.2, 36.3, 35.8, 36.4.....	35.9	11.32	good	175	+0.06
49	7	..	4540	150	6	d1-2v, v3-40, f0-1v, v4r.....	37.3, 36.9, 35.7, 37.3.....	36.8	11.20	good	180	+0.22
50	20	8	4553.56	150	6	b6-7v, v2-3f, v1-2d.....	38.1, 39.7, 41.3.....	39.7	10.71	fair	193	+0.14
51	Oct. 5	7	4568.54	150	6	b5-6v, v4f, v2d.....	39.1, 41.2, 41.8.....	40.7	10.55	good	8	-0.06
52	11	6	4574.52	80	6	b5v, d0-1v, v4f.....	39.6, 39.3, 41.2.....	40.0	10.66	good	14	-0.03

TABLE 58.—6100 RV HERCULIS. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
	1898		2410000+									
53	Oct. 15	6	4578.52	80	6	d2v, f2v, v4r	37.8, 35.2, 37.3...	36.7	11.20	good	18	+0.42
54	31	7	4594.54	150	6	d1-2v, v30, f2v, v4r	38.3, 36.4, 35.2, 37.3	36.8	11.19	fair	34	+0.07
55	Nov. 5	6	4599.50	150	6	f5v, v1v, v1v, v6s	32.2, 32.3, 32.4, 33.3	32.5	11.88	good	39	+0.62
56	11	8	4605.58	150	6	o2-3v, v2-3s	30.9, 29.8	30.3	12.22	fair	45	+0.80
57	12	7	4606.52	150	6	o3-4v, v1s	29.9, 29.3	29.6	12.35	fair	46	+0.90
58	19	6	4613.50	150	6	s1v		26.3	12.87	moon	53	+1.24
	1899											
59	Jan. 8	18	4664.00	150	6	v glimpsed, limit 2 < s		<25	<13.0	poor	...	...
60	10	18	4666.00	200	6	v not seen, limit 3-4 < s		<24	<13.2	...	...	...
61	Feb. 15	17	4701.96	150	6	r4v, v0-1s	29.3, 27.8	29.6	12.35	good	141	-1.37
62	Mar. 4	17	4718.96	150	6	f2v, v4r, v40, v0-1d	35.2, 37.3, 37.4, 40.3	37.6	11.06	fair	158	-1.59
63	19	17	4733.96	...	6	v1b, e6v, v3-4d	45.1, 45.2, 43.3...	44.5	9.88	good	173	-1.54
64	Apr. 4	16	4749.92	40	6	v1b, e3-4v	45.6, 47.7	46.6	9.66	good	189	-0.99
65	16	15	4761.88	40	6	e6v, v1b, v7-8d	45.2, 45.6, 47.3...	45.9	9.77	good	1	-0.78
66	21	15	4766.88	40	6	e6-7v, v6, v6d	44.7, 44.6, 45.8...	44.9	9.84	good	6	-0.75
67	28	9	4773.63	40	6	e6-8v, b1v, v5d	44.2, 43.6, 44.8...	44.0	9.99	good	13	-0.71
68	May 1	9	4776.63	40	6	b2v, v4d	42.6, 43.8	43.3	10.10	good	16	-0.64
69	4	9	4779.63	40	6	b2-3v, v5d	42.1, 44.8	42.6	10.23	fair	19	-0.56
70	9	9	4784.63	40	6	b2v, v2d	42.6, 41.8	42.0	10.31	fair	24	-0.58
71	18	9	4793.63	40	6	b2v, v3-4d	42.6, 43.3	42.0	10.31	fair	24	-0.58
72	29	9	4804.63	150	6	b3v, v2-3d	41.6, 42.3	42.0	10.31	fair	24	-0.58
73	June 3	9	4809.63	150	6	b2-3v, v2-3d	42.1, 42.1	42.0	10.31	fair	24	-0.58
74	13	9	4819.63	150	6	b6-8v, d2v	37.6, 37.8	37.4	11.05	fair	33	-0.06
75	24	9	4830.63	150	6	d2-3v, v1, v4r	37.3, 37.2, 37.3...	37.4	11.05	fair	33	-0.06
76	July 8	9	4844.63	200	6	f3-4v, v1, v1v, v4s	33.7, 33.3, 32.4, 31.3	32.7	11.85	good	44	+0.46
77	Oct. 7	7	4935.54	150	6	r2-3v, v3s	30.8, 30.3	30.6	12.19	good	49	+0.66
78	17	7	4945.54	80	6	s3v		24.3	13.16	good	59	+1.63
79	24	6	4952.50	150	6	v not seen, limit 1-2 < s		<26	<12.9	fair	70	...
80	30	6	4958.50	150	6	v not seen, limit 3-4 < s		<24	<13.1	good	...	...
81	Nov. 4	6	4963.50	150	6	v2r, f2v, v2-30, d1v	35.3, 35.2, 35.9, 38.8	36.3	11.26	fair	175	+0.02
82	15	6	4974.50	150	6	v2d, v3-4f, b4v	41.8, 40.7, 40.6...	41.0	10.48	fair	185	-0.30
83	20	6	4979.50	150	6	v4f, b6v±, v3d	41.2, 38.6, 42.8...	41.3	10.43	fair	192	-0.16
84	Nov. 26	6	4985.50	150	6	b3-4v, v4f, v3d	41.1, 41.2, 42.8...	41.7	10.37	fair	198	-0.15
85	Dec. 5	6	4994.50	150	6	b3v, v3-4d, v4f	41.6, 43.3, 41.2...	42.0	10.31	good	3	-0.26
86	26	18	5016.00	200	6	b4v, v4f	40.6, 41.2	40.9	10.50	fair	14	-0.21
87	Jan. 7	...	5027	200	6	b4v, v2d	40.6, 41.8	41.3	10.43	fair	19	-0.37
88	20	15	5040.88	350	40	b4v, v2-3d	40.6, 42.3	40.1	10.62	good	25	-0.29
89	26	15	5046.88	350	40	b5v, v1d, v2f	39.6, 40.8, 39.2...	40.1	10.62	good	25	-0.29
90	Feb. 5	16	5056.92	350	40	b6v, v2d, v3-4f	38.6, 41.8, 40.7...	39.6	11.29	fair	34	+0.71
91	18	15	5069.88	350	40	d4v, v1-20	35.8, 34.9	36.1	11.29	fair	34	+0.71
92	22	15	5073.88	350	40	d1-2v, v20	38.3, 35.4	25±	13.0	fair	56	+1.23
93	25	18	5076.98	350	40	s2v ?						
94	Mar. 7	...	5086	275	12	v not seen, limit 4 < s		<23	<13.4	good	...	...
95	15	...	5094	350	40	v glimpsed, not < 15 ^m		...	15±	fair	80	...
96	22	12	5101.75	350	40	P2v, v1δ, v3k, v2β	12.5, 12.4, 11.5, 12.0	12.1	14.96	good	86	+1.73
97	Apr. 4	15	5114.88	275	12	p4v, vδ, v3k, v1β	10.1, 11.4, 11.5, 11.0	11.1	15.09	good	96	+1.20
98	17	9	5125.63	150	6	v not seen, limit 1½ ^m < s		...	<14.2	poor	...	...
99	18	9	5126.63	275	12	P6v, δ3v, v0-1k	8.5, 8.4, 9.0	8.6	15.45	fair	113	+0.99
						v not held, k and δ glimpsed		< 8.5	<15.5	poor	...	...
						v not seen, limit 4-5 < a		<22.4	<13.5	good	...	...
						v not seen, limit 1 ^m < s		...	<13.7	moon	...	...
						v4P, v2v, v8-10v, v5p	18.5, 13.7, (17.9), 19.5	15.9	14.41	good	141	+0.68
						vα, s3-4v, v2v	26.9, 23.8, 17.4	22.7	13.42	good	154	+0.44
						v1β, β limit		28.8	12.49	poor	165	+0.40
						v1-2s		30.0	12.29	good	166	+0.30
						v2s, v4s, v1-2v	29.3, 30.9, 31.8					
						v1s±	28.3					

TABLE 58.—6100 RV HERCULIS. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
	1900		2410000+									
100	Apr. 30	10	5140.67	150	6	f1v, v0, v4v, v6s	36.2, 33.4, 37.3, 33.3	35.0	11.49	....	180	+0.50
101	May 19	9	5159.63	150	6	f0-1v, v20	36.7, 35.3	36.0	11.30	good	199	+0.77
102	31	13	5171.79	237	40	f1v, v2v, v6s, v0	36.2, 35.3, 33.3, 33.4	34.5	11.38	fair	11	+0.71
103	June 17	9	5188.63	150	6	f4v, v2-3v, v20	33.2, 35.8, 35.4	34.8	11.51	good	28	+0.53
104	July 12	10	5213.69	237	40	(photometer, v0m.32v)	.....	.....	12.26	fair	53	+0.63
105	21	9	5222.63	150	6	(v0m.15s)	.....	.....	13.17	fair	62	+1.19
106	Aug. 30	9	5262.63	350	40	s3v±	12.7, 10.0, 15.5, 15.4	13.4	14.77	good	102	+0.57
107	Sept. 12	9	5275.63	75	12	v not seen, limit 1 < a	.....	.....	.....	.....	.....	.....
108	13	8	5276.58	237	40	(photometer v0m.70v)	11.0	.....	.....	.....	.....	.....
109	Oct. 4	8	5297.58	237	40	(v0m.06s)	.....	11.2	14.96	good	116	+0.48
110	16	9	5309.63	450	40	(P2-3v, v4, v2-3k, v5v, v1s)	12.0, 11.4, 11.0, 10.7	.....	.....	.....	.....	.....
111	26	7	5319.54	150	6	v not seen, limit 1	.....	.....	.....	.....	.....	.....
112	May 18	9	5523.63	80	12	s6v, v5-6v, v3-4v	21.3, 21.2, 23.4	21.9	13.53	fair	137	-0.38
113	June 3	10	5539.67	237	40	s1v, v5v, limit v	26.3, 28.4	27.3	12.71	fair	149	-0.57
114	July 20	..	5586	..	24	s5v, v near limit	.....	22.3	13.47	good	163	+1.23
115	Oct. 18	8	5676.58	80	12	r2v, v5s	31.3, 32.3	31.8	12.00	fair	179	+0.57
116	31	7	5689.54	..	..	{θ, ε, γ, and β near limit.}	limit of 24-inch 15m.2	<26.9	<12.8	fair	...	.....
117	Nov. 7	8	5696.58	60	24	{P and δ seen, but not k.}	.....	<16	<14	.....	.....	.....
118	12	7	5701.54	350	40	v not seen, limit 1	.....	<24.4	<13.2	.....	.....	.....
119	Feb. 3	17	5784.96	80	12	v not seen, γ glimpsed	10.7, 11.0, 11.5, 10.4	10.8	15.13	fair	141	+1.41
120	Mar. 5	11	5814.71	237	40	v not seen, limit 2-3 < a	10.5	.....	.....	.....	.....	.....
121	28	16	5837.92	237	40	v5v, v1s, P3v, v2k, δ1v	.....	.....	.....	.....	.....	.....
122	July 27	..	5858	..	24	b4-5v, v3d	40.1, 42.8	41.4	10.40	fair	24	-0.49
123	Oct. 1	8	6024.58	237	40	v is between f and r	.....	35±	11.48	.....	54	-0.20
124	Mar. 20	17	6194.96	237	40	v	.....	33.3	11.77	good	77	-0.93
125	Apr. 4	15	6209.88	40	6	photograph	.....	.....	11.9±	.....	..	.....
126	May 17	..	6252	67	12	photometer	.....	.....	10.51	poor	64	-1.58
127	July 24	..	6320	350	40	v5-6f	.....	42.7	10.22	fair	34	-0.89
128	Sept. 20	..	6378	40	6	photometer	.....	.....	10.96	good	49	-0.57
129	May 14	..	6615	40	6	v not seen, limit 0	.....	<33	<11.8	poor	..	.....
130	June 19	..	6651	..	24	s6-8v, v2v	20.3, 17.7	19.0	13.98	poor	160	+1.49
131	July 1	10	6662.67	60	24	photometer	.....	.....	10.71	good	18	-0.07
132	31	..	6693	40	6	b6v, v4, v5f	38.6, 39.8, 42.2	39.9	10.69	good	55	-1.02
133	Aug. 4	10	6697.67	67	12	03v, v3s, v4-5v	30.4, 30.3, 28.8	29.8	12.31	good	91	-1.01
134	11	10	6704.67	67	12	s2-3v, v5s	24.8, 31.9	28.4	12.55	good	102	-1.65
135	Sept. 2	..	6726	67	12	v not seen, limit 1m < s	.....	.....	<13.7	fine	..	.....
136	14	..	6738	..	24	v not held, perhaps a 1-2v	.....	<25.4	<13.00	fair	137	-0.91
137	Oct. 8	9	6762.61	237	40	v not seen, limit 4 < a	.....	<23	<13.4	good	..	.....
138	Nov. 30	6	6815.50	40	6	v perhaps glimpsed, v3v ?	.....	23.9	13.2	good	166	+1.2±
139	Jan. 12	18	6859.00	40	6	photograph	.....	.....	.....	.....	.....	.....
140	Feb. 14	16	6891.92	250	40	s8-10v, v8-10s	18.3	.....	.....	.....	.....	.....
141	Mar. 5	16	6910.88	237	40	b4v, v2d	40.6, 41.8	41.2	10.47	fair	55	-1.24
142	12	13	6917.77	237	40	r2v, v7s	31.3, 34.3	32.0	11.95	fair	99	-2.08
143	26	13	6931.79	237	40	a6-8v, v5v	19.9, 20.7	20.3	13.77	good	131	-0.30
144	Apr. 4	15	6940.88	237	40	06-8v, v2s	26.4, 28.9	28.1	12.58	fair	151	-0.61
145	11	16	6947.92	237	40	s3v, v6s	24.3, 32.9	26.5	12.82	good	157	+0.10
146	Apr. 22	10	6958.67	237	40	v4-5v, vP, v10v±	11.2, 14.5, (16.9)	13.4	14.76	fair	171	+2.36
						v2v, v5P	13.7, 19.5	.....	.....	.....	180	+3.45
						s10-12v, va, v6v	16.3, 23.3, 21.7	22.9	13.40	good	187	+2.65
						s4v, v6s	23.3, 29.3	26.3	12.88	fair	198	+2.33

TABLE 58.—6100 RV HERCULIS. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C.S.T.	Julian Day G. M. T.					Steps.	Mag.			
	1905		2410000+									
147	Apr. 30	13	6966.79	237	40	v1-2s		28.8	12.48	good	6	+1.98
148	May 31	9	6997.63	40	6	e8v, vb, v7d	43.2, 44.6, 46.8...	44.8	9.85	good	37	-1.35
149	June 13	14	7010.83	237	40	photometer .....		....	10.00	good	50	-1.6±
150	22	9	7019.63	150	6	v3b, v4d, e8v	47.6, 43.8, 43.2...	45.2	9.79	fair	59	-2.12
151	July 24	9	7051.63	150	6	d2v, v2f	37.8, 39.2	38.5	10.90	fair	91	-2.70
152	Aug. 9	8	7067.60	150	6	s1-2v±		25.8	12.92	moon	107	-1.39
153	20	9	7068.62	237	40	s5v, v3-4a	22.3, 26.8	24.6	13.11	poor	118	-1.31
154	22	9	7080.63	237	40	s3-4v, v1a	23.8, 24.3	24.1	13.19	good	120	-1.33
155	Sept. 2	12	7091.75	237	40	a5v, v4v	18.3, 19.7	19.0	13.96	fair	131	-0.14
156	19	11	7108.71	237	40	v3v, v1-2β	12.7, 11.5	12.1	14.95	fair	148	+2.15
157	Oct. 21	8	7140.58	237	40	v4v, v1P	11.7, 15.5	13.6	14.75	good	180	+3.76
158	31	7	7150.54	237	40	a3v, v3 v8P±	20.3, 18.7, (22.5)..	19.5	13.89	good	190	+3.21
159	Nov. 18	6	7168.48	237	40	s1v, v7a	26.3, 30.3	26.8	12.80	good	8	+2.20

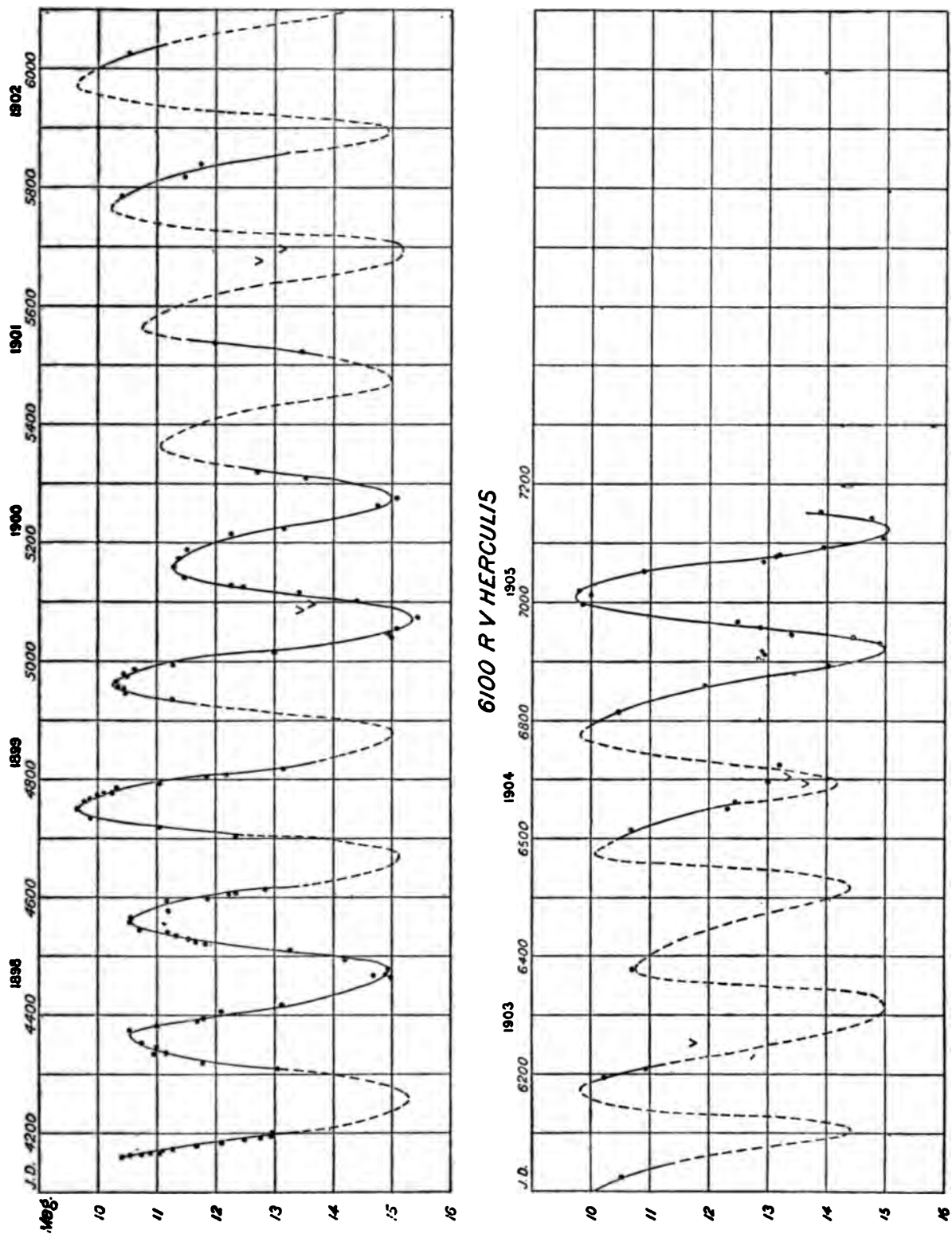


FIG 20.—LIGHT-CURVE OF RV HERCULIS.

TABLE 59.—6100 RV HERCULIS. MEAN MAGNITUDES FROM 16½ DAY GROUPS.—Continued.

Group No....	1	2	3	4	5	6	7	8	9	10	11	12
J. D.....	16	33	50	66	83	100	116	133	150	166	183	200
6560 {	<i>t</i>	....	....	....	55	....	91	102	....	137	166	....
	<i>M</i>	....	....	....	10.69	....	12.31	12.55	....	13.00	13.2±	....
	<i>ΔM</i>	....	....	....	-1.02	....	-1.01	-1.65	....	-0.91	+1.2±	....
	No.	....	....	....	1	....	1	1	....	1	1	....
6760 {	<i>t</i>	....	....	....	55	....	99	....	131	....	151	....
	<i>M</i>	....	....	....	10.47	....	11.95	....	13.77	....	12.58	....
	<i>ΔM</i>	....	....	....	-1.24	....	-2.08	....	-0.30	....	-0.61	....
	No.	....	....	....	1	....	1	....	1	....	1	....
6960 {	<i>t</i>	....	....	....	....	....	....	....	....	....	....	....
	<i>M</i>	....	....	....	....	....	....	....	....	....	....	....
	<i>ΔM</i>	....	....	....	....	....	....	....	....	....	....	....
	No.	....	....	....	....	....	....	....	....	....	....	....
Means {	<i>t</i>	9	23	42	55	78	94	107	124	140	158	176
	<i>M</i>	10.62	11.02	11.87	11.91	13.5±	13.10	14.44	14.37	13.77	12.64	11.18
	<i>ΔM</i>	-0.03	+0.15	+0.52	+0.32	-0.58	-0.21	+0.12	+0.10	-0.27	-0.08	-0.04
	No.	17	14	17	7	2	4	6	2	7	14	9

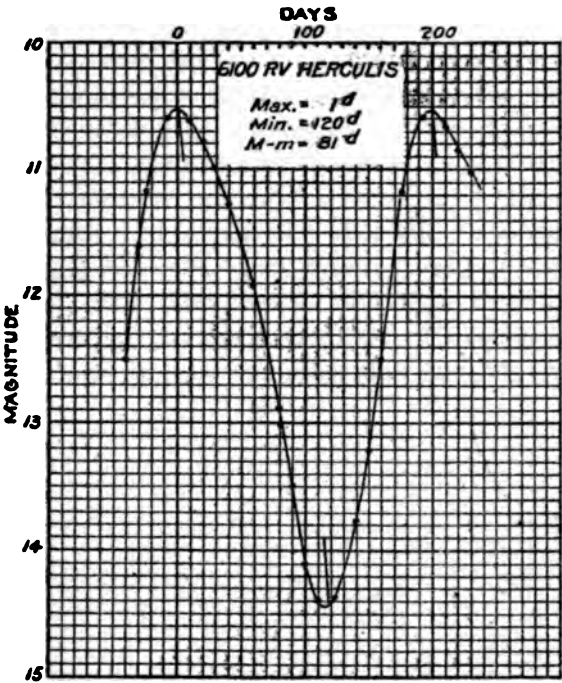


FIG. 21.—MEAN LIGHT-CURVE OF RV HERCULIS.

TABLE 60.—6100 RV HERCULES. OBSERVED MAXIMA AND MINIMA.
Elements of maximum. 1998, March 12 J. D. 2414345, +200^h E. M—m = 0.4.

Epoch.	MAXIMA.							MINIMA.						
	Date.		Mag.		Corr.	Wt.	Epoch.	Date.		Mag.		Corr.	Wt.	
	Calendar.	J. D.	H.	P.				Calendar.	J. D.	H.	P.			
-1	1897 Aug. 23	4160	.....	mc	- 1	10	0	1897 Dec. 1	4260	.....	mc	-20	1	
0	1898 Mar. 15	4364	10.50	10.75	- 3	12	1	1898 July 2	4473	15.3	15.6	- 7	8	
1	Sept. 28	4561	10.6	10.8	0	20	2	1899 Jan. 15	4670	.....	mc	-10	1	
2	1899 Apr. 6	4751	9.68	9.93	-10	17	3	Aug. 11	4873	.....	mc	- 2	1	
3	Nov. 1	4960	10.25	10.50	- 1	12	4	1900 Feb. 17	5068	15.35	15.60	-12	12	
4	1900 May 21	5161	11.30	11.55	0	12	5	Sept. 11	5274	14.97	15.22	- 6	8	
5	Dec. 6	5360	.....	mc	- 1	1	6	1901 Mar. 26	5470	.....	mc	-10	1	
6	1901 June 29	5565	.....	mc	+ 4	1	7	Oct. 29	5687	.....	mc	+ 7	2	
7	1902 Jan. 22	5772	.....	mc	+11	2	8	1902 May 20	5890	.....	mc	+10	0	
9	1903 Feb. 24	6170	.....	mc	- 9	2	9	Dec. 16	6100	.....	mc	+20	0	
10	Sept. 22	6380	.....	mc	-19	1	10	1903 July 14	6310	.....	mc	+30	1	
11	1904 Apr. 2	6572	.....	mc	+11	1	12	1904 Aug. 3	6696	14.0	14.2	+16	2	
12	Oct. 18	6772	.....	mc	+11	3	13	1905 Mar. 15	6880	15.00	15.25	+40	9	
13	1905 June 14	7011	9.70	9.95	+50	15	14	Oct. 4	7123	15.40	15.65	+43	12	

The mean light-curve was derived from the observations up to 1905 March 5 (J. D. 6911). So far the period 200 days satisfied the measures, but the succeeding observations, covering the maximum and minimum of epoch 12, indicate a slightly longer period, perhaps 204 days. The light-curve has several notable features. The range is more than five magnitudes, unusually large for the length of period. The decline is as rapid as the rise, and the minimum is as sharply defined as the maximum. There is a suspicion of a secondary maximum arising from three anomalous observations near the minima of epochs 11 and 12, but the evidence is hardly sufficient to definitely settle the question. A considerable range will be noticed in the magnitude at the maxima, the star reaching 9.7 at epochs 2 and 12, but only reaching 11.3 at epoch 4.

TABLE 62.—COMPARISON STARS IN B. D. CATALOGUE.

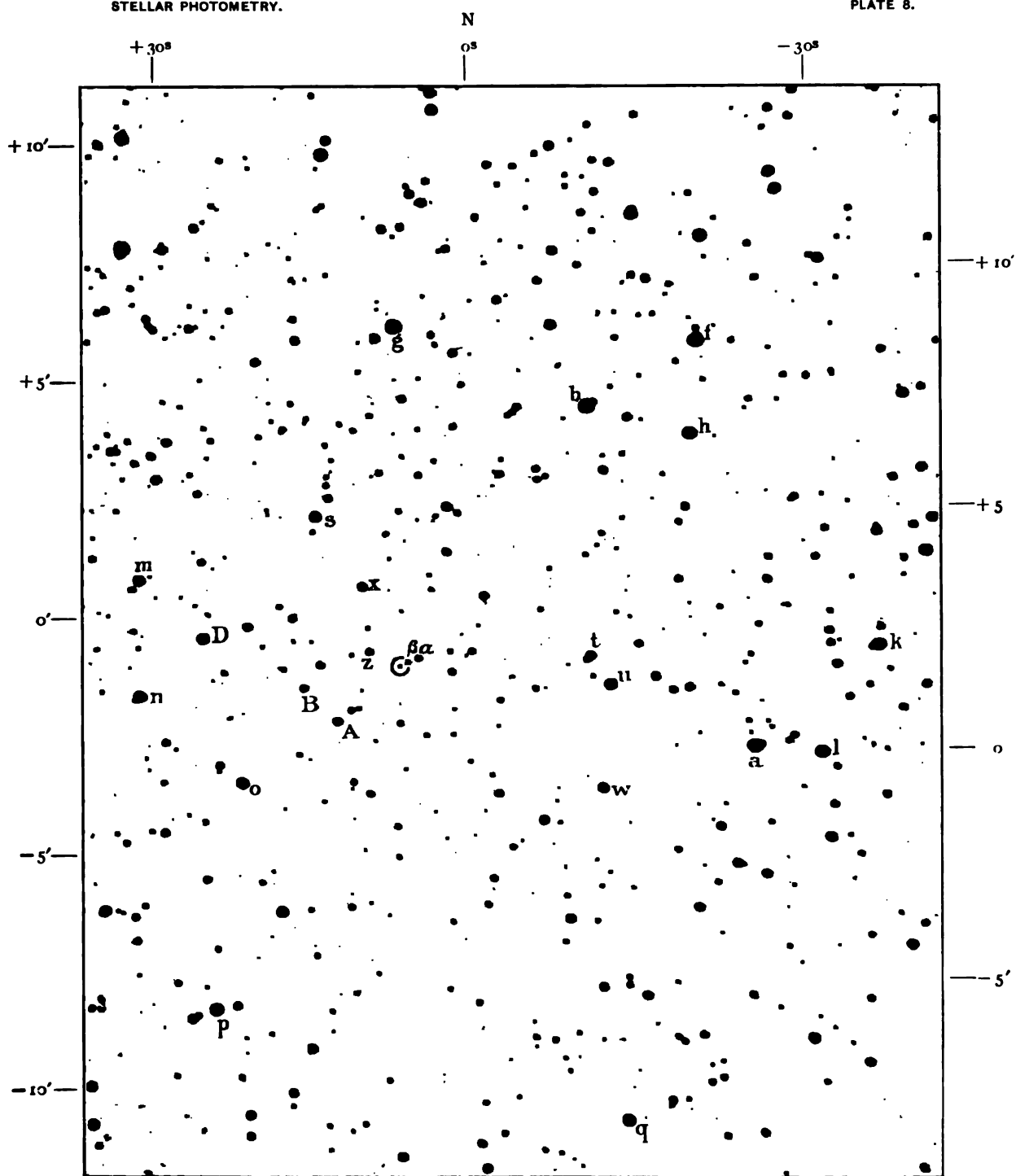
Star.	B. D.		1855.		Star.	B. D.		1855.	
	No.	Mag.	R. A.	Dec.		No.	Mag.	R. A.	Dec.
	°		<i>h m s</i>	° ' "		°		<i>h m s</i>	° ' "
<i>e</i>	+25 3748	8.8	19 6 27	+25 30.4	<i>b</i>	+25 3752	9.5	19 7 02	+25 51.9
<i>a</i>	+25 3750	9.5	19 6 41	+25 45.2	<i>c</i>	+25 3755	8.9	19 7 44	+25 58.1

TABLE 63.—COMPARISON STARS FOR S LYRÆ (IN ORDER OF RIGHT ASCENSION).

Star.	Coordinates from Variable.			Light Scale, Steps.	Magnitude.			
	R. A.		Dec.		Measured		From Curve.	
					H.	P.	H.	P.
	"	s	"					
e	-637	-47.1	-922	44.2	....	....	8.40	8.82
h	-604	-44.6	+113	24.6	....	....	11.18	11.60
r	-574	-42.4	-602	29.6	....	....	10.50	10.92
l	-553	-40.9	-28	24.6	....	....	11.18	11.60
a	-465	-34.4	-35	34.2	9.69	10.11	....	....
g	-371	-27.4	-525	29.6	....	....	10.50	10.92
k	-326	-24.1	+344	25.6	....	....	11.05	11.47
f	-318	-23.5	+463	32.6	....	....	10.06	10.48
w	-281	-20.8	-115	23.5	....	....	11.34	11.76
u	-281	-20.8	+14	24.5	....	....	11.21	11.63
t	-241	-17.8	+47	21.0	....	....	11.67	12.09
b	-192	-14.2	+360	34.3	9.86	10.23	....	....
a	-22	-1.5	+13	2.3	14.01	14.43	....	....
β	-9	-0.7	+8	0	var.?	....	....	....
s	+43	+3.2	+12	11.4	12.82	13.24	....	....
x	+64	+4.7	+94	18.4	12.18	12.60	....	....
A	+66	+4.9	-80	....	....	....	....	....
g	+67	+5.0	-399	30.6	10.46	10.88	....	....
B	-117	+8.6	-46	....	....	....	....	....
s	-137	+10.1	+173	21.0	11.56	11.98	....	....
p	+170	+12.6	-476	27.6	....	....	10.78	11.20
o	+178	+13.2	-177	24.7	....	....	11.18	11.60
D	+252	+18.6	-1	21.5	11.46	11.88	....	....
n	+322	+23.8	-86	24.7	....	....	11.18	11.60
m	+346	+25.6	+58	25.6	10.90	11.32	....	....
c	+369	+27.3	+739	42.2	....	....	8.68	9.10
d	+463	+34.2	-837	....	....	....	....	....
E'	+555	+41.0	-903	....	6.91	7.33	....	....

STELLAR PHOTOMETRY.

PLATE 8.



Scale, 1 mm = 7".8.

os S - 30s

1902 December 1.

6894 S LYRÆ.

R. A. 19^h 0^m 6^s.3. Dec. + 25° 50' 17", 1900.

TABLE 64.—6894 S LYRÆ. PHOTOMETER MEASURES OF COMPARISON STARS

1903 November 7.			6-INCH.				Good.	
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3	Mean of 6.		H.	P.
<i>h m</i>	<i>°</i>							
21 17	33	<i>H'</i> _{a1}	15.5 15.0 15.5	15.33	15.52	1.02	7.87	8.29
		<i>E'</i> _{a1}	13.2 13.8 13.4	13.50	13.84	0.76	7.61	8.03
		<i>G'</i> _{a1}	18.7 19.0 18.9	18.87	18.65	1.44	8.29	8.71
		<i>G'</i>	12.2 12.3 12.7	12.40	12.45	0.56	7.41	7.83
		<i>a</i>	31.3 31.6 31.9	31.60	32.02	2.94	9.79	10.21
		<i>b</i>	33.0 32.8 33.0	32.93	33.20	3.07	9.92	10.34
		<i>g</i>	37.9 37.2 37.2	37.43	37.27	3.59	10.44	10.86
		<i>g</i>	36.8 37.1 37.4	37.10	.....	.....	.....	.....
		<i>b</i>	33.9 33.3 33.2	33.47	.....	.....	.....	.....
		<i>a</i>	32.5 32.4 32.4	32.43	.....	.....	.....	.....
		<i>G'</i>	12.3 12.4 12.8	12.50	.....	.....	.....	.....
		<i>G'</i> _{a1}	17.8 18.8 18.7	18.43	.....	.....	.....	.....
		<i>F'</i> _{a1}	10.1 10.1 9.8	10.00	.....	.....	.....	.....
		<i>E'</i> _{a1}	13.9 14.4 14.2	14.17	.....	.....	.....	.....
21 37	36	<i>H'</i> _{a1}	15.9 15.6 15.6	15.70	.....	.....	.....	.....
1903 November 8.								
							Good.	
21 12	31	<i>g</i>	36.1 36.1 36.3	36.17	36.67	3.53	10.32	10.74
		<i>b</i>	33.0 33.7 33.7	33.47	33.17	3.07	9.86	10.28
		<i>a</i>	31.2 31.6 31.6	31.47	31.32	2.84	9.63	10.05
		<i>F'</i> _{a1}	6.0 6.1 5.7	5.93	.....	0.03	6.82	7.24
		<i>G'</i> _{a1}	17.8 18.3 18.6	18.23	18.40	1.40	8.19	8.61
		<i>E'</i> _{a1}	15.0 14.9 15.0	14.97	14.90	0.92	7.71	8.13
		<i>H'</i> _{a1}	15.4 15.2 16.2	15.60	15.55	1.01	7.80	8.22
		<i>H'</i> _{a1}	16.0 15.2 15.3	15.50	.....	.....	.....	.....
		<i>E'</i> _{a1}	14.7 15.0 14.8	14.83	.....	.....	.....	.....
		<i>G'</i> _{a1}	18.8 18.3 18.6	18.57	.....	.....	.....	.....
		<i>a</i>	31.2 31.0 31.3	31.17	.....	.....	.....	.....
		<i>b</i>	33.1 32.6 32.9	32.87	.....	.....	.....	.....
21 38	34	<i>g</i>	37.1 37.1 37.3	37.17	.....	.....	.....	.....
1903 November 24.			Seeing good; moon 6 days old.					
23 4	51	<i>G'</i>	12.3 11.7 12.1	12.03	12.98	0.63	7.43	7.85
		<i>a</i>	31.0 31.1 31.2	31.10	31.84	2.91	9.71	10.13
		<i>b</i>	31.1 31.8 32.0	31.63	32.78	3.08	9.88	10.30
		<i>g</i>	37.2 37.4 37.3	37.30	37.62	3.62	10.42	10.84
		<i>E'</i> _{a1}	14.2 14.0 14.7	14.30	14.50	0.86	7.66	8.08
		<i>H'</i> _{a1}	15.8 16.1 16.1	16.00	.....	1.08	7.88	8.30
		<i>H'</i>	9.7 10.9 9.9	10.17	.....	0.30	7.10	7.52
		<i>E'</i> _{a1}	15.1 14.8 14.2	14.70	.....	.....	.....	.....
		<i>g</i>	38.1 37.8 37.9	37.93	.....	.....	.....	.....
		<i>b</i>	34.1 33.8 33.9	33.93	.....	.....	.....	.....
		<i>a</i>	33.1 32.2 32.4	32.57	.....	.....	.....	.....
		<i>G'</i>	14.2 13.7 13.9	13.93	.....	.....	.....	.....
23 28	55	<i>G'</i> _{a1}	19.8 20.1 19.4	19.70	.....	.....	.....	.....

TABLE 64.—6894 S LYRÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1902 July 7.			12-INCH.				Very good.	
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
<i>h m</i> 16 30	°	<i>A'</i>	14.7 13.4 13.3	13.80	12.47	0.72	8.05	8.47
		<i>B'</i>	10.0 7.8 8.5	8.77	.....	0.32	7.65	8.07
		<i>B'as</i>	24.5 26.2 25.7	25.47	22.84	2.01	9.34	9.76
		<i>C'</i>	16.8 18.0 18.3	17.70	17.39	1.37	8.70	9.12
		<i>E'as</i>	16.2 17.9 17.6	17.23	15.25	1.08	8.41	8.83
		<i>a</i>	26.9 28.8 28.5	28.07	27.47	2.41	9.74	10.16
		<i>b</i>	30.5 31.0 30.0	30.50	29.25	2.58	9.91	10.33
		<i>g</i>	33.8 32.4 33.0	33.07	33.49	3.02	10.35	10.77
		<i>s</i>	44.0 45.3 46.2	45.17	44.30	4.25	11.58	12.00
		<i>m</i>	39.0 39.8 39.2	39.33	.....	3.69	11.02	11.44
		<i>s</i>	42.2 43.7 44.4	43.43	.....	.....	.....	.....
		<i>g</i>	33.2 34.7 33.8	33.90	.....	.....	.....	.....
		<i>b</i>	27.2 28.9 27.9	28.00	.....	.....	.....	.....
		<i>a</i>	28.0 26.2 26.4	26.87	.....	.....	.....	.....
		<i>E'as</i>	11.2 14.7 13.9	13.27	.....	.....	.....	.....
		<i>C'</i>	16.2 17.5 17.5	17.07	.....	.....	.....	.....
		<i>B'as</i>	19.5 20.0 19.9	19.80	.....	.....	.....	.....
17 25		<i>A'</i>	11.2 11.0 11.2	11.13	.....	.....	.....	.....
1902 October 5.			Seeing good.					
21 5		<i>a</i>	19.9 20.9 21.1	20.63	21.72	1.80	9.62	10.04
		<i>b</i>	22.9 23.2 23.2	23.10	23.17	2.04	9.86	10.28
		<i>g</i>	30.3 30.1 30.4	30.27	30.59	2.71	10.53	10.95
		<i>s</i>	40.3 41.9 41.7	41.43	40.62	3.85	11.67	12.09
		<i>x</i>	47.5 47.5 46.7	47.23	45.52	4.39	12.21	12.63
		<i>D</i>	40.8 40.2 40.5	40.50	38.74	3.64	11.46	11.88
		<i>m</i>	33.3 34.6 34.1	34.00	33.26	3.00	10.82	11.24
		<i>E'as</i>	12.9 13.2 12.9	13.00	12.24	0.70	8.52	8.94
		<i>C'</i>	14.3 14.3 14.0	14.20	14.35	0.91	8.73	9.15
		<i>B'as</i>	16.8 16.5 16.8	16.70	16.20	1.22	9.04	9.46
		<i>A'as</i>	25.1 24.7 25.0	24.93	.....	2.19	10.01	10.43
		<i>A'</i>	6.5 6.9 7.1	6.83	.....	0.15	7.97	8.39
		<i>B'as</i>	15.0 15.3 16.8	15.70	.....	.....	.....	.....
		<i>C'</i>	14.1 15.2 14.2	14.50	.....	.....	.....	.....
		<i>E'as</i>	10.5 12.2 11.7	11.47	.....	.....	.....	.....
		<i>m</i>	31.8 33.5 33.2	32.50	.....	.....	.....	.....
		<i>D</i>	37.2 37.0 36.7	36.97	.....	.....	.....	.....
		<i>x</i>	43.8 43.9 43.7	43.80	.....	.....	.....	.....
		<i>s</i>	40.8 38.8 39.8	39.80	.....	.....	.....	.....
		<i>g</i>	30.8 31.3 30.6	30.90	.....	.....	.....	.....
		<i>b</i>	23.7 23.2 22.8	23.23	.....	.....	.....	.....
21 57		<i>a</i>	22.2 21.7 21.5	21.80	.....	.....	.....	.....
1903 November 10.			Good.					
21 7	29	<i>a</i>	18.9 18.2 19.0	18.70	18.49	1.51	9.70	10.12
		<i>b</i>	19.6 20.3 20.0	19.97	19.40	1.63	9.82	10.24
		<i>g</i>	26.0 26.4 26.1	26.17	26.09	2.30	10.49	10.91
		<i>s</i>	35.8 36.0 35.3	35.70	35.42	3.23	11.42	11.84
		<i>x</i>	42.0 41.2 41.5	41.57	41.55	3.95	12.14	12.56
		<i>m</i>	30.2 30.3 30.2	30.23	30.27	2.68	10.87	11.29
		<i>m</i>	30.7 30.2 30.0	30.30	.....	.....	.....	.....
		<i>x</i>	41.7 41.3 41.6	41.53	.....	.....	.....	.....
		<i>s</i>	36.0 35.2 34.2	35.13	.....	.....	.....	.....
		<i>g</i>	25.2 26.0 25.8	26.00	.....	.....	.....	.....
		<i>b</i>	18.8 18.7 19.0	18.83	.....	.....	.....	.....
21 27	32	<i>a</i>	18.7 18.3 17.8	18.27	.....	.....	.....	.....
		<i>Gas</i>	8.0 9.1 9.0	8.70	.....	.....	.....	.....

TABLE 64.—6894 S LYRÆ, PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1902 November 3.			40-INCH, WEDGE V.		Seeing poor and getting worse.			
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
h m		s	33.0 33.1 34.9	33.67	34.17	3.10	11.57	11.99
		x	36.0 37.1 36.1	36.40	39.20	3.69	12.16	12.58
		z	44.8 43.8 43.8	44.13	44.48	4.26	12.73	13.15
		v	57.4 56.4 56.4	56.73	57.18	5.35	13.82	14.24
		β	59.2 59.1 58.3	58.87	.....	5.43	13.90	14.32
		a	58.6 58.2 58.2	58.33	58.18	5.41	13.88	14.30
		a	58.2 58.7 57.2	58.03	.....	.....	.....	.....
		v	56.5 56.6 59.8	57.63	.....	.....	.....	.....
		z	44.8 44.0 45.7	44.83	.....	.....	.....	.....
		x	41.8 43.2 41.0	42.00	.....	.....	.....	.....
	23 26	s	34.0 35.0 35.0	34.67	.....	.....	.....	.....
1902 October 31.								
21 30		s	28.3 30.0 30.3	29.53	29.20	2.57	11.66	12.08
		x	32.2 33.2 33.2	32.87	33.05	2.99	12.08	12.50
		z	37.8 39.4 40.8	39.33	38.88	3.64	12.73	13.15
		v	53.5 52.8 52.3	52.87	52.74	5.05	14.14	14.56
		β	57.2 54.5 55.6	55.77	53.17	5.09	14.18	14.60
		a	53.0 50.8 53.0	52.27	50.25	4.83	13.92	14.34
		a	50.7 46.2 47.8	48.23	.....	.....	.....	.....
		β	50.2 50.2 51.3	50.57	.....	.....	.....	.....
		v	53.0 52.5 52.3	52.60	.....	.....	.....	.....
		z	38.0 39.5 37.8	38.43	.....	.....	.....	.....
		x	33.7 32.8 33.2	33.22	.....	.....	.....	.....
22 0	s	28.0 29.2 29.4	28.87	.....	.....	.....	.....
1902 October 31.								
Seeing fair.								
22 28		s	27.0 29.7 31.1	29.27	31.80	2.84	11.66	12.08
		x	32.0 32.8 32.0	32.27	35.67	3.26	12.08	12.50
		z	37.7 38.6 40.0	38.77	41.20	3.91	12.73	13.15
		v	51.7 52.8 52.3	52.27	54.27	5.18	14.00	14.42
		β	56.0 56.7 56.7	56.47	56.10	5.30	14.12	14.54
		a	54.5 55.0 55.2	54.90	56.15	5.30	14.12	14.54
		a	58.2 56.5 57.5	57.40	.....	.....	.....	.....
		β	55.2 56.0 56.0	55.73	.....	.....	.....	.....
		v	56.5 57.3 55.0	56.27	.....	.....	.....	.....
		z	44.0 43.9 43.0	43.63	.....	.....	.....	.....
		x	39.5 37.8 39.9	39.07	.....	.....	.....	.....
22 28	s	33.9 34.0 35.1	34.33	.....	.....	.....	.....
1904 May 20.								
Good.								
14 50		a	45.2 47.4 46.5	46.37	46.99	4.53	14.11	14.53
		β	52.0 53.0 52.9	52.63	54.57	5.20	14.78	15.20
		z	37.0 38.6 37.0	37.53	37.58	3.50	13.08	13.50
		x	28.8 29.7 29.9	29.47	.....	2.60	12.18	12.60
		z	38.7 36.9 37.3	37.63	.....	.....	.....	.....
		β	55.8 55.9 57.8	56.50	.....	.....	.....	.....
17 5		a	48.8 46.8 47.2	47.60	.....	.....	.....	.....
	v	14.7 14.8 14.1	14.53	.....	1.00	10.58	11.00	

TABLE 65.—6894 S LYRÆ. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

6-INCH.															
Star.	November 7.					November 8.					November 24.				
	C.	Obs. Mag.		Δ Mag.		C.	Obs. Mag.		Δ Mag.		C.	Obs. Mag.		Δ Mag.	
		H.	P.	H.	P.		H.	P.	H.	P.		H.	P.		
E'...	0.01	6.86	7.28	-.02	+.04	0.17	6.96	7.38	+.08	+.14	0.11	6.91	7.33	+.03	+.09
G'...	0.62	7.47	7.89	+.07	-.08	0.65	7.44	7.86	+.04	-.11	0.63	7.43	7.85	+.03	-.12
H'...	0.27	7.12	7.54	+.04	+.04	0.26	7.05	7.47	-.11	-.03	0.32	7.12	7.54	-.04	+.04
Means	0.30	7.15	7.57	±.04	±.05	0.36	7.15	7.57	±.08	±.09	0.35	7.15	7.57	±.03	±.08
M ₀...	....	6.85	7.27	.....	.....	....	6.79	7.21	.....	.....	....	6.80	7.22	.....	.....

12-INCH.					40-INCH.					
Star.	Mag. 6-inch.	C.			Star.	Mag. 12-inch.	C.			
		July 7.	Oct. 5.	Nov. 10.			Oct. 31.	Oct. 31.	Nov. 3.	May 20.
a.....	9.71	2.41	1.80	1.51	g.....	10.46	....	....	....	....
b.....	9.89	2.58	2.04	1.63	s.....	11.56	2.57	2.84	3.10	....
g.....	10.39	3.02	2.71	2.30	x.....	12.18	2.99	3.26	3.69	2.60
Mean C.	....	2.67	2.18	1.81	Mean C...	....	2.78	3.05	3.40	2.60
Mean Mag	10.00	10.00	10.00	10.00	Mean Mag.	....	11.87	11.87	11.87	12.18
M ₀.....	....	7.33	7.82	8.19	M ₀.....	....	9.09	8.82	8.47	9.58

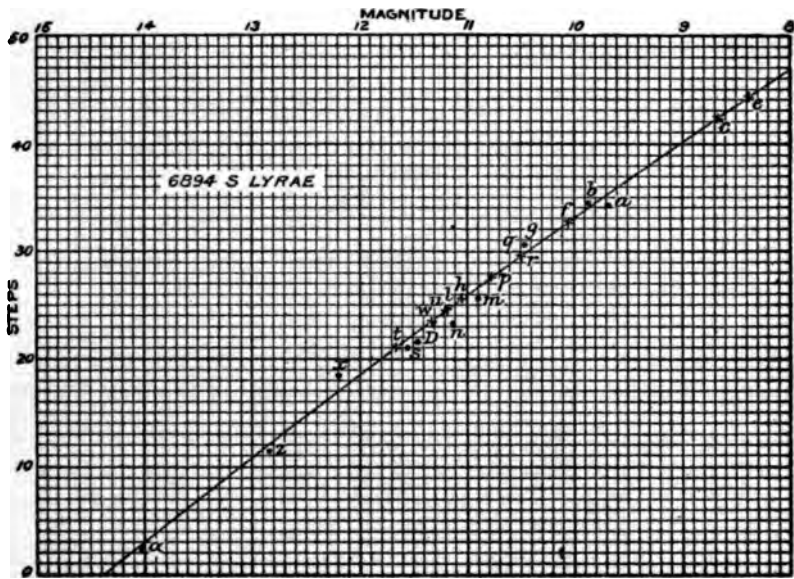


FIG. 22.—MAGNITUDE-CURVE FOR S LYRÆ.

TABLE 66.—6894 S LYRÆ. MEAN MAGNITUDES OF COMPARISON STARS.

[illegible]

TABLE 67.—6894 S LYRÆ. VISUAL OBSERVATIONS OF THE VARIABLE.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	J Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
1	1896 Oct. 7	..	2410000+3840	80	6	(a2b, b4f, j2g, g5h, h1k, kl) (g1q, qr, g3p, p2m, mn, no) (o2s, st, limit s and t.....)		< 21	< 11.6	....	0	....
2	Nov. 12	..	3876	150	6	u1w, u3-4t		< 21	< 11.6	good	36	....
3	26	7	3890.54	150	6	s4x		< 18	< 12.1	good	...	....
4	Dec. 9	6	3903.50	150	6	s1-2x, difficult		< 18	< 12.1	moon	...	....
5	23	6	3917.50	150	6	s1-2x, sv, limit x		21.0	11.68	good	77	+0.11
6	1897 Jan. 9	9	3934.63	80	6	a4-5v, b5v, v3l, v1h	29.7, 29.0, 27.6, 26.6.	28.0	10.72	low	94	-0.36
7	May 25	10	4070.67	150	6	g5v, v1m	25.6, 26.6	26.1	10.99	good	230	-0.21
8	June 11	9	4087.63	150	6	v4s, o1-2v, m2v	25.0, 24.2, 23.6	24.2	11.25	good	247	-0.24
9	July 1	9	4107.63	150	6	vs, v2x, m6v	21.0, 20.4, 19.6	20.3	11.77	good	267	-0.09
10	16	9	4122.63	150	6	s1v, v2x	20.0, 20.4	20.2	11.78	good	282	-0.34
11	26	9	4132.63	150	6	s1v, v1x	20.0, 19.4	19.7	11.86	fair	292	-0.46
12	Aug. 27	8	4164.58	150	6	x1v, v glimpsed		17.4	12.15	fine	324	-0.85
13	Sept. 17	8	4185.58	80	6	x3-4v±, z1-2v	14.9, 9.9	12.4	12.79	fine	345	-0.66
14	22	8	4190.56	150	6	z2-3v, v glimpsed		8.9	13.25	fine	350	-0.27
15	Oct. 25	7	4223.54	150	6	v not seen, limit 1-2 < A		< 19	< 11.9	good	...	....
16	Nov. 16	6	4245.50	150	6	v not seen, limit z		< 11	< 13.0	fine	...	....
17	Dec. 29	6	4288.50	150	6	v not seen, limit z		< 11	< 13.0	good	...	....
18	1898 Feb. 15	17	4336.96	150	6	v not seen, limit x		< 18	< 12.1	good	...	....
19	Mar. 2	17	4351.96	150	6	v4z, v2s, D1v, m3-4v	15.4, 23.0, 20.5, 22.1	20.0	11.80	fine	76	+0.20
20	23	16	4372.92	150	6	v2m, v1n, v6s, g4v	27.6, 25.7, 27.0, 26.6	26.7	10.91	good	96	-0.13
21	Apr. 1	16	4381.92	150	6	v6n, v1g, b2v	30.7, 31.6, 32.3	31.5	10.20	good	106	-0.59
22	15	16	4395.92	150	6	v2g, b3v	32.6, 31.3	31.9	10.17	good	120	-0.31
23	May 7	10	4417.67	40	6	a4v, b2v, v2g	31.2, 32.3, 32.6	32.0	10.16	fair	141	-0.05
24	21	9	4431.63	40	6	b2v, v3g	32.3, 33.6	32.4	10.09	fair	155	-0.14
25	June 14	..	4455	80	12	b3v, v2g	31.3, 32.6	32.4	10.09	fair	179	+0.30
26	27	..	4468	80	12	g2v, v1-2m	28.6, 27.1	27.8	10.77	fair	192	+0.46
27	July 5	11	4476.71	80	12	b4-5v, v2g, limit 3 < z	29.8, 32.6	31.2	10.27	good	192	-0.46
28	18	11	4489.71	80	12	g4-5v, v2m, c8a, e10a	26.1, 27.6	26.8	10.90	good	200	+0.13
29	Aug. 1	10	4503.67	80	12	g4v, v1-2m	26.6, 27.1	26.8	10.90	fair	213	-0.07
30	18	10	4520.67	80	12	g4v, m2v, vn	26.6, 23.6, 25.6	25.2	11.10	moon	227	-0.07
31	Sept. 7	8	4540.58	...	6	m6v, v1s, v4x, limit z	19.6, 22.0, 22.4	21.3	11.62	fair	244	+0.32
32	20	8	4553.58	...	6	m6-8v, s2v, v2x, v4z, limit z	18.6, 19.0, 20.4, 15.4	18.3	12.03	good	264	+0.22
33	Oct. 8	7	4571.54	150	6	v glimpsed, s3-4v		17.5	12.13	fair	277	+0.10
34	Nov. 1	6	4595.50	150	6	s2v, vx, v3z, limit z	19.0, 18.4, 14.4	17.2	12.17	fine	295	-0.23
35	15	7	4609.54	200	6	z1v, v glimpsed		10.4	13.03	good	319	+0.15
					6	v not seen, limit z		< 11	< 13.0	good	...	....
36	1899 Mar. 22	16	4736.92	...	6	v not seen, limit 1-2 < x		< 17	< 12.2	....	...	....
37	Apr. 21	16	4766.92	200	6	v2-3z, v1x, vs, D3v	13.9, 19.4, 21.0, 18.5	18.2	12.05	good	54	-0.25
38	May 1	10	4776.67	150	6	s1v, v2x	20.0, 20.0	20.0	11.80	low	64	-0.18
39	18	10	4793.65	200	6	v2-3s, D2v, uncertain	23.5, 19.5	21.5	11.60	low	81	+0.18
40	29	9	4804.63	150	6	v3s, m1v, v1D	24.0, 24.6, 22.5	23.7	11.32	good	92	+0.15
41	June 7	10	4813.67	150	6	v4D, v1m, g4-5v	25.0, 26.6, 26.1	25.7	11.05	low	101	+0.15
42	13	10	4819.65	150	6	v2-3m, vg, b4v	28.1, 30.6, 30.3	29.6	10.50	good	107	-0.29
43	July 5	10	4841.67	150	6	b3v, v2-3g	33.3, 33.1	33.1	9.99	good	129	-0.33
44	July 10	10	4846.65	150	6	b4v, v1g	30.3, 31.6	30.9	10.31	good	134	+0.04
45	18	9	4854.61	150	6	b4v, v1g	30.3, 31.6	30.9	10.31	moon	142	+0.10
46	Aug. 5	9	4872.63	150	6	b3v, vg	31.3, 30.6	30.9	10.31	fair	160	+0.03
47	10	9	4877.61	150	6	b6v, g2-3v, v4m	28.3, 28.1, 29.6	28.6	10.65	good	165	+0.33
48	26	9	4893.61	150	6	g2v, v3m	28.6, 28.6	28.6	10.65	good	181	+0.15
49	Sept. 4	9	4902.61	150	6	g4v, v1m, v6-7s	26.6, 26.6, 27.5	26.9	10.89	good	190	+0.29
50	12	7	4910.54	150	6	g4v, vm, v4s	26.6, 25.6, 25.0	25.7	11.03	good	198	+0.32
51	26	8	4924.56	150	6	g7-8v, vm, v3-4s	23.1, 25.6, 24.5	24.4	11.20	good	212	+0.27
52	Oct. 4	8	4932.56	150	6	m2v, v1s	23.6, 22.0	22.8	11.42	poor	220	+0.35
53	23	7	4951.54	150	6	m2-3v, v0-1s, v2x	23.1, 21.5, 20.4	21.6	11.59	good	239	+0.26

TABLE 67.—6894 S LYRÆ. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
54	1899		2410000+									
55	Oct. 30	6	4958.50	150	6	m6v, vs	19.6, 21.0	20.3	11.77	fair	246	+0.28
56	Nov. 6	6	4965.50	150	6	s2v, v0-1x	19.0, 18.9	18.9	11.96	good	253	+0.34
57	20	6	4979.50	...	6	v not seen, limit 2 < z	...	<19	<11.9	...	...	...
57	22	7	4981.54	200	6	s2v, v2x, v3x	19.0, 20.4, 14.4	17.9	12.08	good	269	+0.18
58	1900											
58	Feb. 24	18	5075.98	175	12	v suspected, limit 4 < z	...	<7	<13.5	fair	...	...
59	Mar. 2	16	5081.92	275	12	v not held, limit 5 < z	...	<6	<13.6	...	...	...
60	22	15	5101.85	350	40	a2v, v1β	0.3, 1.0	0.6	14.27	good	389	-0.13
61	Apr. 4	15	5114.88	275	12	v or a glimpsed, at limit	...	2	14.1±	good	...	...
62	6	16	5116.92	350	40	z8-10a, a3-4β, β4v	...	-4.0	14.87	fair	404	+0.18
63	May 2	15	5142.88	460	40	z7-8a, a1β, β4v	...	-4.0	14.87	fair	430	+0.06
64	11	14	5151.83	460	40	a2β, β4v, z6-8a	...	-4.0	14.87	fair	3	+0.10
65	28	10	5168.67	275	12	v not seen, limit 5-6 < z	...	<6	<13.6	good	...	...
66	29	12	5169.75	237	40	z10v, v3a, a1-2β	1.4, 5.3	3.3	13.95	good	21	-0.40
67	June 19	12	5190.75	350	40	z4v, v6a, a3-4β	7.4, 8.3	7.8	13.39	poor	42	+0.51
68	28	10	5199.67	237	40	x6v, v1z	12.4, 12.4	12.4	12.78	good	51	+0.38
69	Aug. 6	9	5238.63	150	6	m3v, v2D, v6x	22.6, 23.5, 24.4	23.5	11.35	moon	90	+0.15
70	13	9	5245.63	150	6	v6-7s, v3m, v4D, vm	27.5, 28.6, 25.5, 24.7	26.5	10.95	good	97	-0.05
71	20	8	5252.58	40	6	v5m, vg	30.6, 30.6	30.6	10.35	poor	102	-0.54
72	Sept. 5	8	5268.58	40	6	a3v, b1-2v, v3g	31.2, 32.8, 33.6	32.5	10.07	fair	120	-0.42
73	15	7	5278.54	150	6	b3v, vg, v6m	33.3, 30.6, 31.6	31.8	10.19	good	130	-0.11
74	Oct. 26	6	5319.50	150	6	a3v, b1v, v1g, v6m	31.2, 33.3, 31.6, 30.6	31.9	10.18	good	171	-0.21
75	Nov. 21	6	5345.50	150	6	g4v, v4m	26.6, 29.6	28.1	10.70	poor	197	-0.02
76	1901											
76	Nov. 12	7	5701.54	350	40	g4-5v	...	26.6	10.94	good	117	+0.39
77	1902											
77	Mar. 5	16	5814.92	237	40	m2v, v4D	23.6, 25.5	24.6	11.19	fair	231	-0.04
78	28	14	5837.83	237	40	v3x, vs, vD, m5v	21.4, 21.0, 21.5, 21.6	21.4	11.60	good	253	-0.02
79	May 14	13	5884.79	67	12	v not seen, x seen	...	<18	<12.1	good	...	...
80	July 7	10	5938.67	67	12	z3-4v, v glimpsed	...	7.9	13.38	good	354	-0.25
81	Oct. 5	9	6028.63	67	12	v not seen, limit z	...	<11	<13.0	good	8	...
82	10	9	6033.63	237	40	v±, vβ±	2±, 0±	1±	14.2±	moon	13	-0.04
83	20	8	6043.58	237	40	photometer	...	...	14.02	fair	23	-0.18
84	31	7	6054.54	237	40	{ photometer	...	...	14.07	fair	34	+0.77
85	Nov. 3	8	6057.58	237	40	photometer	...	...	13.82	poor	37	+0.63
86	Dec. 1	...	6084	...	24	photograph	...	...	15.0	...	64	...
87	23	7	6107.54	237	40	s2v, v2x	19.0, 20.4	19.7	11.87	good	87	+0.57
88	1903											
88	Oct. 10	10	6398.67	67	12	v not seen, limit 1 < x	...	<17	<12.2	moon	89	...
89	11	7	6399.54	150	6	v not seen, limit z	...	<11	<13.0	good	...	...
90	13	9	6401.63	80	12	v not seen, limit 1 < z	...	<10	<13.1	good	...	...
91	1904											
91	May 17	11	6618.71	40	6	b3-4v, v2g	30.8, 32.6	31.7	10.20	good	162	-0.10
92	20	9	6621.63	237	40	photometer	...	...	9.74	good	165	-0.58
93	Aug. 4	8	6697.58	150	6	s1v, v2-3x	20.0, 20.9	20.4	11.76	fair	241	+0.25
94	27	...	6720	150	6	s3v, vx	18.0, 18.4	18.2	12.03	good	266	+0.19
95	Sept. 24	8	6748.58	...	24	photographs	...	...	14	fair	292	...
96	Oct. 8	10	6762.67	237	40	z4v, v10-12a, a5β	7.4, 13.3	9±	13.2	fair	306	+0.5±
97	Nov. 30	6	6815.50	40	6	v not seen, limit x	...	<18	<12.1	good	...	...
98	1905											
98	Jan. 3	6	6849.50	750	40	a4β, β2-3v, v near limit	...	-2.5	14.67	fair	393	+0.17
99	Feb. 14	17	6891.94	750	40	a3-4β, β5-6v, near limit	...	-5.5	15.05	fair	0	+0.25
100	Mar. 12	16	6917.94	750	40	a4β, β4v	...	-4.0	14.87	fair	25	+0.77
101	Apr. 4	16	6940.92	{237}	{750}	{ a2-3v, v1β	{ -0.2, 1.0	{ 0.0	14.59	good	48	+1.99
						{ a4v, vβ	{ -1.7, 0.0					

TABLE 67.—6894 S LYRAE. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day. G. M. T.					Steps.	Mag.			
102	1905 Apr. 11	16	2410000+ 6947.92	750	40	{ $v_{4\beta}, v_{1^a}, z$ is $2^M > v \dots$ } ($z_{8v}, v_{4^a} \dots$)	4.0, 3.3.....	3.5	13.91	good	55	+1.60
103	30	14	6966.83	237	40	$z_{8v}, v_{4^a} \dots$	3.4, 6.3.....	5.3	13.69	good	74	+2.09
104	May 20	10	6986.67	237	40	$x_{2v}, v_{3z} \dots$	16.4, 14.4.....	15.4	12.40	good	94	+1.31
105	June 13	14	7010.83	237	40	$v_{g\pm} \dots$	.....	30.6	10.34	good	118	-0.17
106	20	12	7017.75	237	40	$b_{2-3v}, v_{2-3g} \dots$	31.8, 33.1.....	32.4	10.06	good	125	-0.32
107	24	9	7021.63	80	12	$g_{5v}, v_{0-1m} \dots$	25.6, 26.1.....	25.9	11.01	poor	129	+0.68
108	26	10	7023.67	80	12	$g_{2v}, v_{2-3m} \dots$	28.6, 28.1.....	28.4	10.67	good	131	-0.37
109	July 23	10	7050.67	237	40	photometer.....	.....	.....	10.6±	good	158	+0.3±
110	26	9	7053.63	150	6	$m_{1v}, v_{2D}, v_{4-5s} \dots$	24.6, 23.6, 25.5.....	24.3	11.20	good	161	+0.90
111	Aug. 9	9	7067.63	150	6	$g_{4v}, v_{3m} \dots$	26.6, 28.6.....	27.6	10.79	good	175	+0.37
112	21	9	7079.63	...	12	photographs, 213, 214.....	.....	.....	<10.5	fair	187	....
113	22	9	7080.6	...	12	photographs, 215, 216.....	.....	.....	11.7	good	188	+1.1
114	25	10	7083.67	...	12	photographs, 221, 222.....	.....	.....	11.7	....	191	+1.1
115	28	8	7086.59	150	6	$m_{1v}, v_{3D}, v_{4s} \dots$	24.6, 24.5, 25.0.....	24.7	11.16	good	194	+0.46
116	Sept. 17	7	7106.55	150	6	$m_{2v}, v_{1D}, v_{1-2s} \dots$	23.6, 22.5, 22.5.....	22.9	11.41	good	214	+0.42
117	Oct. 1	10	7120.67	237	40	$s_{2v}, v_{2x} \dots$	19.0, 20.4.....	19.7	11.85	fair	228	+0.65
118	20	7	7139.54	80	12	$s_{1v}, v_{3x} \dots$	20.0, 21.4.....	20.7	11.71	good	247	+0.21
119	Nov. 18	6	7168.50	237	40	$s_{1v} \dots$	.....	10.4	13.05	good	276	+1.02

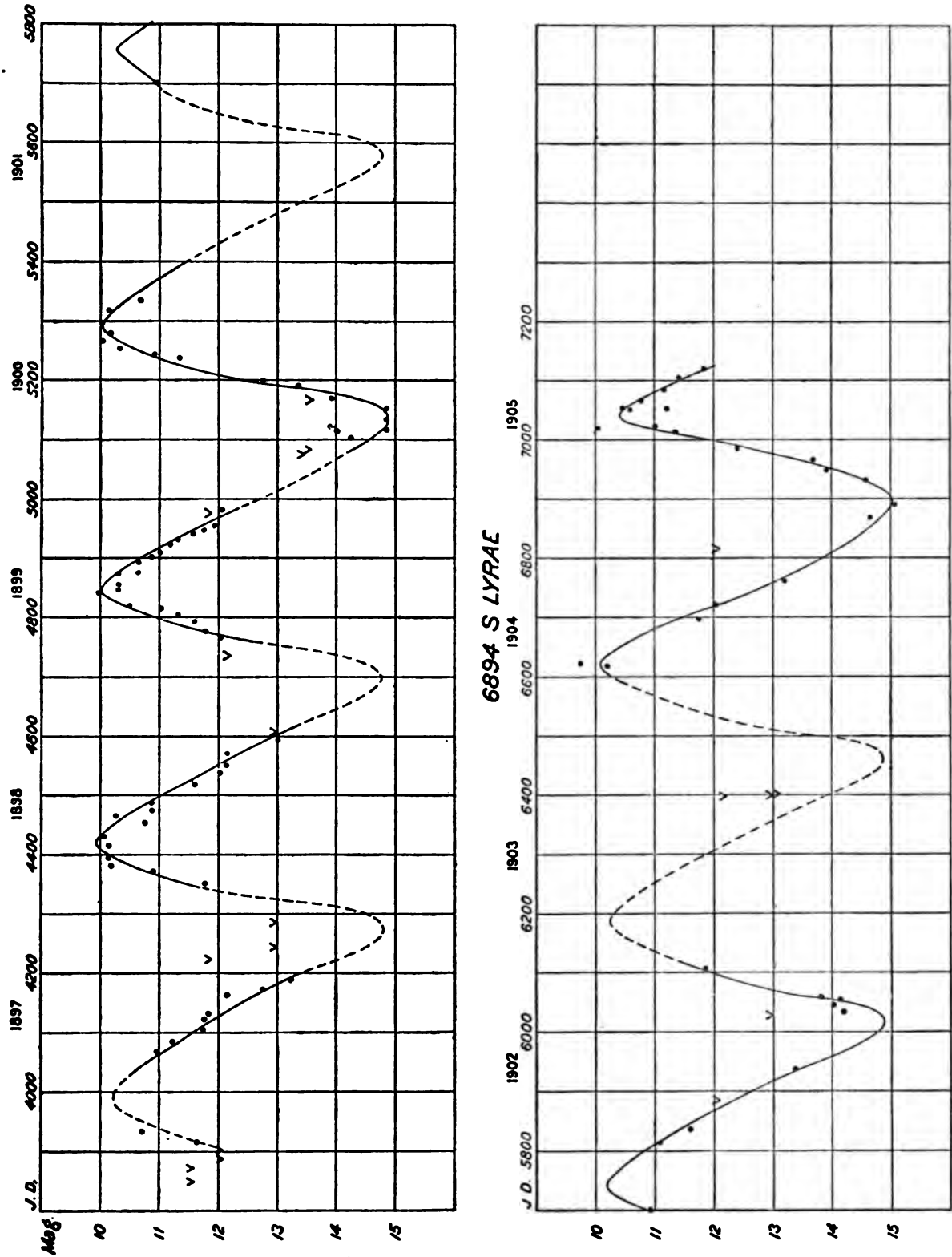


FIG. 23.—LIGHT-CURVE OF S LYRÆ.

TABLE 68.—6894 S LYRE. MEAN MAGNITUDES FROM 36½ DAY GROUPS.

Group No.	1	2	3	4	5	6	7	8	9	10	11	12
J. D.	36	73	109	145	182	218	254	291	327	363	400	436
3840 {	<i>t</i>	....	....	85	....	....	....	238	272	308	348	....
	<i>M</i>	....	....	11.20	....	....	....	11.12	11.78	12.00	13.02	....
	ΔM	....	....	-0.12	....	....	....	-0.22	-0.22	-0.66	-0.46	....
	No.	....	....	2	....	....	....	2	2	2	2	....
4276 {	<i>t</i>	....	....	93	130	167	202	236	270	307	....	....
	<i>M</i>	....	....	10.97	10.16	10.43	10.69	11.36	12.08	12.60	....	....
	ΔM	....	....	-0.17	-0.18	-0.08	-0.13	+0.12	+0.16	-0.04	....	....
	No.	....	....	3	2	2	3	2	2	2	....	....
4712 {	<i>t</i>	....	59	95	135	169	200	240	269	....	389	417
	<i>M</i>	....	11.92	11.12	10.20	10.54	11.04	11.68	12.08	....	14.27	14.87
	ΔM	....	-0.22	+0.05	-0.06	+0.17	+0.29	+0.31	+0.18	....	-0.13	+0.12
	No.	....	2	4	3	3	3	4	1	....	1	2
5148 {	<i>t</i>	12	46	96	125	171	197	....	....	....	....	....
	<i>M</i>	14.41	13.08	10.85	10.13	10.18	10.70	....	....	....	....	....
	ΔM	-0.15	+0.44	-0.15	-0.26	-0.21	-0.02	....	....	....	....	....
	No.	2	2	3	2	1	1	....	....	....	....	....
5584 {	<i>t</i>	....	....	....	117	....	....	242	....	....	354	....
	<i>M</i>	....	....	....	10.94	....	....	11.40	....	....	13.38	....
	ΔM	....	....	....	+0.39	....	....	-0.03	....	....	-0.25	....
	No.	....	....	....	1	....	....	2	....	....	1	....
6020 {	<i>t</i>	23	37	87	....	....	....	....	....	....	....	....
	<i>M</i>	14.10	13.82	11.87	....	....	....	....	....	....	....	....
	ΔM	+0.06	+0.63	+0.57	....	....	....	....	....	....	....	....
	No.	3	1	1	....	....	....	....	....	....	....	....
6456 {	<i>t</i>	....	....	....	....	164	....	241	266	306	....	393
	<i>M</i>	....	....	....	....	9.97	....	11.76	12.03	13.2±	....	14.67
	ΔM	....	....	....	....	-0.34	....	+0.25	+0.19	+0.5±	....	-0.17
	No.	....	....	....	....	2	....	1	1	1	....	1
6892 {	<i>t</i>	25	....	....	....	....	....	....	....	....	....	....
	<i>M</i>	14.87	....	....	....	....	....	....	....	....	....	....
	ΔM	+0.77	....	....	....	....	....	....	....	....	....	....
	No.	1	....	....	....	....	....	....	....	....	....	....
Means {	<i>t</i>	20	47	91	127	168	200	239	270	307	351	391
	<i>M</i>	14.46	12.61	11.20	10.36	10.28	10.81	11.46	11.99	12.48	13.20	14.47
	ΔM	+0.13	+0.21	-0.03	-0.10	-0.06	+0.07	+0.11	+0.04	-0.26	-0.39	+0.02
	No.	8	5	13	8	8	7	11	6	5	3	2

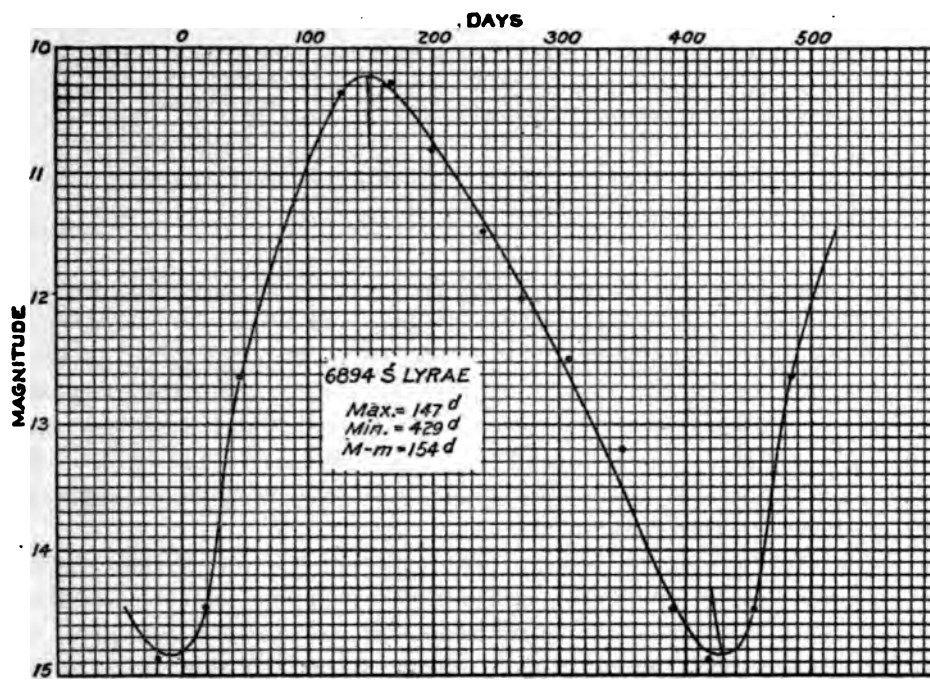


FIG. 24.—MEAN LIGHT-CURVE OF S LYRÆ

TABLE 69.—6894 S LYRÆ. OBSERVED MAXIMA AND MINIMA.
Elements of maximum. 1898 May 12 (J. D. 2414422)+438^d (E-4). M-m=154^d

MAXIMA.							MINIMA.						
Epoch.	Date.		Mag.		Corr.	Wt.	Epoch.	Date.		Mag.		Corr.	Wt.
	Calendar.	J. D.	H.	P.				Calendar.	J. D.	H.	P.		
3	1897 Mar. 4	3988	.....	mc	+ 4	7	4	1897 Dec. 19	4278	.....	mc	+ 10	6
4	1898 May 12	4422	9.95	10.37	0	20	5	1899 Feb. 13	4699	.....	mc	- 7	6
5	1899 July 7	4843	10.00	10.42	- 17	27	6	1900 Apr. 25	5135	14.90	15.32	- 9	16
6	1900 Sept. 29	5292	10.04	10.46	- 6	9	7	1901 July 14	5580	.....	mc	- 2	1
7	1901 Dec. 26	5745	.....	mc	+ 9	3	8	1902 Sept. 25	6018	14.90	15.32	- 2	9
8	1903 Mar. 12	6186	.....	mc	+ 12	1	9	1903 Dec. 13	6462	.....	mc	+ 4	2
9	1904 May 23	6624	.....	mc	+ 12	3	10	1905 Feb. 18	6995	15.01	15.43	- 1	14
10	1905 July 2	7029	10.60	11.02	+ 21	24							

The last comparison used in deriving the mean light-curve was that of 1905 March 12. The curve yields a period of 438 days. Several series of observations, covering the maxima between 1895 and 1900, have been published in the *Astronomical Journal*, by H. M. Parkhurst, who noted an "intermediate maximum" 1896 July 14. Probably for this reason the period which had been given as 430 days in Chandler's Third Catalogue, was called 218 days in his "Revised Elements." The present series excludes such intermediate maxima (except that no evidence is furnished for 1901).

A single observation at Bonn, 1856 July 30, 9.5 magnitude, might refer to this star if a correction of one division of the ocular scale be admitted. If so, the star must have been very near maximum, and calling the epoch -31 the period 436 days results; but as stated above, at present the period is at least 438 days.

Leaving out of account the intermediate maximum in question, the light-curve presents no abnormal features. The total range observed is just about five magnitudes, the different maxima and minima being quite closely accordant, The rise is much faster than the decline, occupying but 35 per cent of the period.

CHAPTER IX.

7220 S CYGNI.

R. A. 20^h 3^m 24^s.7; Dec. + 57° 41' 52" (1900).

This star was discovered at Bonn in 1860 and has been well observed, since Chandler's revised elements depend on 43 maxima and 5 minima, but it does not appear that the minima have ever been completely followed. Townley reports it invisible for two months near minimum in the Madison 15-inch, and in the extended series of observations published in Harvard Annals 37 it was invisible for periods ranging from 70 to 99 days. The photometric measures of comparison stars at Harvard extend only to 13.44, and those by H. M. Parkhurst to 13.48; so that more work was needed in fixing the magnitudes of the fainter comparison stars and following the variable through its minimum. In the Harvard volume above cited the faintest magnitudes noted before and after minimum range from 13.0 to 14.8, and though opportunities for observation when the variable was faint have been few, about a dozen comparisons have been made when it was below the Harvard limit; and photometric magnitudes have been found for the comparison stars down to the faintest used, thus fixing the minimum magnitude of the variable with some precision.

TABLE 70.—7220 S CYGNI. STANDARD MAGNITUDE STARS.

Star.	B. D. No.	1900.		Color, P. DM.	Magnitude.				Residuals.		
		R. A.	Dec.		Catalogue.		Measured.		From Cats.		3 Nights inter se.
					H.C.O.	P. DM.	H.	P.	H.	P.	
B	+ 57 2106	<i>h m s</i> 19 56 58	<i>° ' "</i> + 57 32.1	W	7.08	7.47	7.29	7.54	+ 21	+ 7	± 4
C	+ 57 2129	20 02 32	+ 57 19.5	GW	7.88	7.96	7.53	7.78	- 35	- 18	± 6
D	+ 57 2144	20 05 38	+ 57 29.5	W	7.04	7.32	7.17	7.42	+ 13	+ 10	± 11
Mean...		.....	.....	.....	7.33	7.58	7.33	7.58	± 23	± 12	± 7

TABLE 71.—COMPARISON STARS IN B. D. CATALOGUE.

Star.	B. D.		1855.		Star.	B. D.		1855.	
	No.	Mag.	R. A.	Dec.		No.	Mag.	R. A.	Dec.
	°		<i>h m s</i>	° '		°		<i>h m s</i>	° '
<i>c</i>	+57 2124	8.9	20 00 23	+57 23.9	<i>T</i>	+57 2137	9.0	20 2 44	+57 30.3
<i>d</i>	+57 2128	9.0	20 1 18	+57 36.0	<i>g</i>	+57 2139	9.5	20 3 20	+57 29.0
<i>e</i>	+57 2130	9.3	20 2 4	+57 31.6	<i>b</i>	+57 2149	8.1	20 6 2	+57 53.6
<i>f</i>	+57 2135	8.9	20 2 29	+57 35.1					

TABLE 72.—COMPARISON STARS FOR S CYGNI (IN ORDER OF RIGHT ASCENSION).

Star.	Coordinates from Variables.			Light Scale, Steps.	Magnitude.			
	R. A.		Dec.		Measured.		From Curve.	
					H.	P.	H.	P.
	"	s	"					
c	−990	−124.4	−624	39.7	8.54	8.79	....	....
e	−551	−68.9	+105	36.9	9.39	9.64	....	....
a*	−422	−52.6	−1342	45.1	7.53	7.78	....	....
f	−194	−24.2	−152	32.1	9.87	10.12	....	....
a	−109	−13.4	+72	8.3	13.90	14.15	....	....
y	−74	−9.3	+52	16.4	12.31	12.56	....	....
m'	−45	−5.6	+455	....	....	....	....	....
e	−41	−5.1	+80	0.3	14.94	15.19	....	....
s	−39	−4.4	−4	−0.5	15.48	15.73	15.66	15.91
x	−22	−2.8	−165	19.0	11.95	12.20	....	....
d	+3	+0.3	+45	38.0	8.98	9.23	....	....
v	+8	+1.0	+59	4.8	....	....	14.63	14.88
y	+21	+2.6	−114	4.6	14.34	14.59	....	....
p	+35	+4.4	−170	21.8	....	....	11.43	11.68
m	+49	+6.1	+461	24.1	10.73	10.98	....	....
l'	+82	+10.3	−94	....	....	....	....	....
o	+98	+12.3	+168	22.0	11.32	11.57	....	....
n	+100	+12.5	+445	23.6	....	....	11.12	11.37
l	+105	+13.1	−100	25.7	10.53	10.78	....	....
i	+105	+13.1	+45	10.6	12.8±	13.1±	13.5±	13.7±
T	+125	+15.6	−230	....	8.86	9.11	....	....
k	+162	+20.3	−347	28.7	....	....	10.20	10.45
g	+400	+50.0	−314	33.2	....	....	9.59	9.84

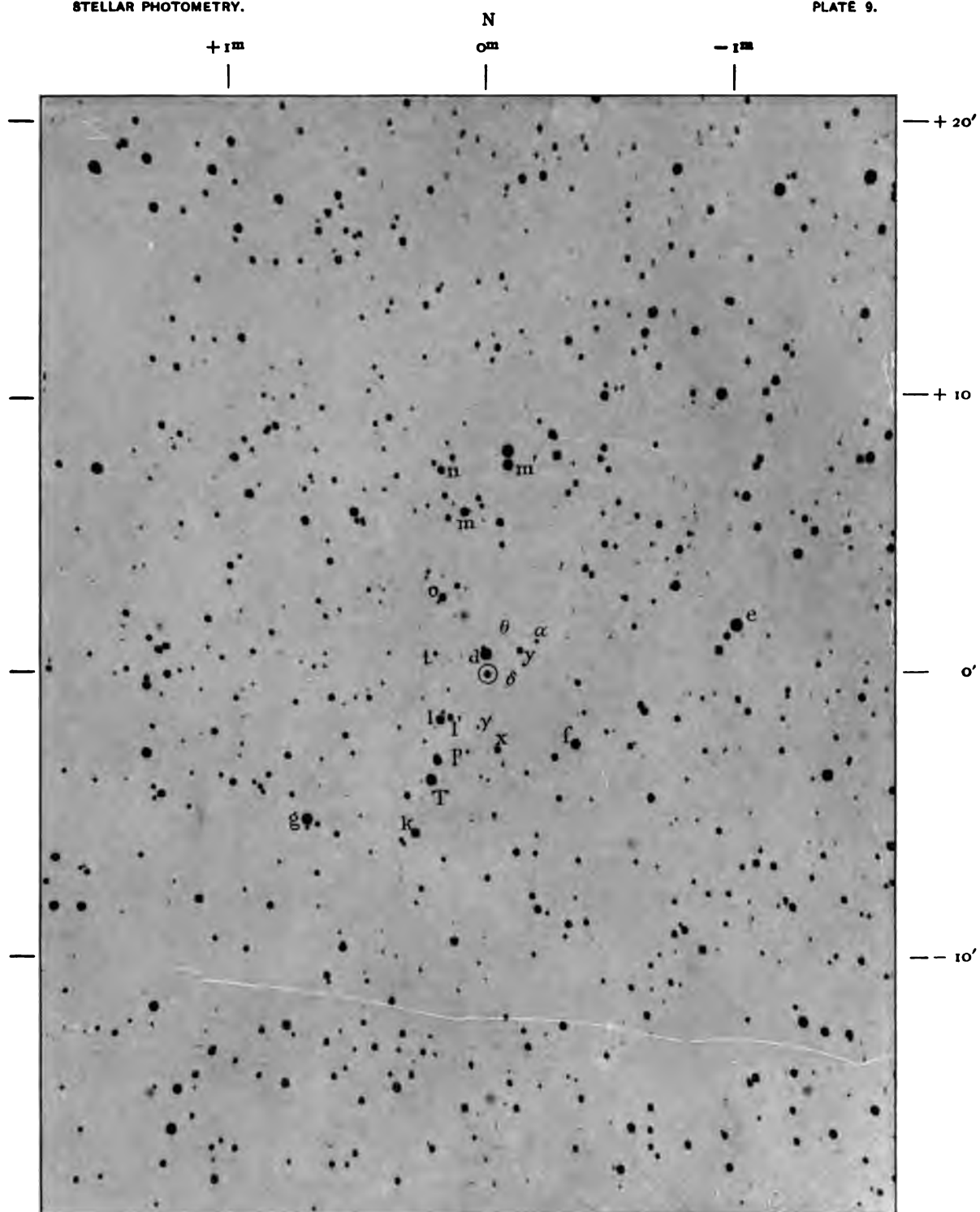
*a = c of Table 71.

TABLE 73.—7220 S CYGNI. PHOTOMETER MEASURES OF COMPARISON STARS.

1904 September 3.			6-INCH.				Good.		
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.		
				Mean of 3.	Mean of 6.		H.	P.	
h m 21 0	° 19	B	10.0 9.7 9.8	9.83	10.17	0.30	7.23	7.48	
		C	12.2 11.7 11.5	11.80	12.02	0.51	7.44	7.69	
		c	20.2 20.0 20.2	20.13	20.88	1.69	8.62	8.87	
		e	24.9 25.6 25.3	25.27	26.90	2.39	9.32	9.57	
		f	30.8 29.9 30.3	30.33	30.67	2.77	9.70	9.95	
		d	24.2 24.3 24.4	24.30	24.80	2.12	9.05	9.30	
		T	24.0 24.5 23.9	24.13	25.00	2.13	9.05	9.31	
		D	11.7 10.8 10.9	11.13	11.17	0.40	7.33	7.58	
		D	11.2 11.2 11.2	11.20	....	....	....	....
		T	26.2 25.3 26.1	25.87	....	....	....	....
		d	25.3 25.4 25.2	25.30	....	....	....	....
		f	31.0 31.0 31.0	31.00	....	....	....	....
		e	28.7 28.3 28.6	28.53	....	....	....	....
		c	22.1 21.8 21.0	21.63	....	....	....	....
		C	12.7 12.5 11.5	12.23	....	....	....	....
21 21	21	B	10.0 10.8 10.7	10.50	....	....	....	....

STELLAR PHOTOMETRY.

PLATE 9.



Scale, 1 mm = 13."3.

S

1902 November 24.

7220 S CYGNI.

R. A. 20h 3m 24s.7. Dec. +57° 41' 52", 1900.

TABLE 73.—7220 S CYGNI. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1904 September 5.			6-INCH.			Good, somewhat dull.		
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
<i>h m</i> 19 30	17	<i>Da</i>	13.8 14.3 14.9	14.33	.....	0.87	7.83	8.08
		<i>T</i>	23.2 23.0 22.0	22.73	.....	2.00	8.96	9.21
		<i>d</i>	24.0 23.0 23.5	23.50	24.24	2.06	9.02	9.27
		<i>f</i>	31.1 30.8 30.8	30.90	31.30	2.84	9.80	10.05
		<i>e</i>	26.0 26.6 26.9	26.50	25.79	2.22	9.18	9.43
		<i>c</i>	20.0 19.9 20.4	20.10	20.62	1.66	8.62	8.87
	16	<i>C</i>	13.2 12.5 13.3	13.00	13.05	0.65	7.61	7.86
		<i>B</i>	10.3 10.7 10.2	10.40	10.54	0.34	7.30	7.55
		<i>B</i>	11.1 10.1 10.8	10.67	.....	.....	.....	.....
		<i>C</i>	13.3 13.2 12.8	13.10	.....	.....	.....	.....
		<i>c</i>	20.7 21.5 21.2	21.13	.....	.....	.....	.....
		<i>e</i>	24.9 25.3 25.0	25.07	.....	.....	.....	.....
		<i>f</i>	31.4 31.9 31.8	31.70	.....	.....	.....	.....
		<i>d</i>	24.9 25.0 25.0	24.97	.....	.....	.....	.....
1904 October 1. Good.								
<i>h m</i> 21 33	21	<i>D</i>	8.8 9.7 9.2	9.23	9.33	0.22	7.10	7.35
		<i>T</i>	23.9 23.9 24.8	24.20	23.69	2.01	8.89	9.14
		<i>d</i>	25.1 26.2 25.8	25.70	25.09	2.14	9.02	9.27
		<i>f</i>	32.9 32.9 32.9	32.90	32.35	2.98	9.86	10.11
		<i>e</i>	26.8 27.7 27.1	27.20	27.49	2.40	9.28	9.53
		<i>c</i>	21.6 21.1 21.2	21.30	20.79	1.68	8.56	8.81
		<i>C</i>	12.9 13.2 13.2	13.10	13.24	0.67	7.55	7.80
		<i>B</i>	11.0 11.5 11.1	11.20	11.47	0.45	7.33	7.58
		<i>B</i>	11.8 11.7 11.7	11.73	.....	.....	.....	.....
		<i>C</i>	13.7 13.4 13.0	13.37	.....	.....	.....	.....
		<i>c</i>	20.0 19.8 21.0	20.27	.....	.....	.....	.....
		<i>e</i>	27.9 27.8 27.6	27.77	.....	.....	.....	.....
		<i>f</i>	31.3 32.2 31.9	31.80	.....	.....	.....	.....
		<i>d</i>	24.3 24.9 24.2	24.47	.....	.....	.....	.....
		<i>T</i>	22.8 23.1 23.6	23.17	.....	.....	.....	.....
<i>h m</i> 21 53	24	<i>D</i>	9.8 9.3 9.2	9.43	.....	.....	.....	.....
1904 August 13. 12-INCH. Good.								
<i>h m</i> 17 48	26	<i>c</i>	17.2 17.5 16.8	17.17	17.59	1.41	8.42	8.67
		<i>e</i>	25.5 26.3 26.4	26.07	27.07	2.37	9.38	9.63
		<i>f</i>	32.0 31.7 31.8	31.83	31.98	2.85	9.86	10.11
		<i>x</i>	53.5 54.6 54.2	54.10	54.12	5.16	12.17	12.42
		<i>T</i>	24.2 23.0 22.5	23.23	22.35	1.96	8.97	9.22
		<i>l</i>	38.2 39.0 38.6	38.60	37.97	3.55	10.56	10.81
		<i>v</i>	39.7 40.6 39.7	40.00	.....	3.78	10.79	11.04
		<i>d</i>	22.5 23.9 23.1	23.17	22.99	2.02	9.03	9.28
		<i>o</i>	43.8 44.7 45.0	44.50	45.17	4.35	11.36	11.61
		<i>m</i>	40.7 41.5 41.0	41.07	40.99	3.88	10.89	11.14
		<i>m</i>	40.9 41.1 40.7	40.90	.....	.....	.....	.....
		<i>o</i>	45.2 46.6 45.7	45.82	.....	.....	.....	.....
		<i>d</i>	23.4 23.1 21.9	22.80	.....	.....	.....	.....
		<i>l</i>	36.7 37.5 37.8	37.33	.....	.....	.....	.....
		<i>T</i>	22.0 22.1 20.3	21.47	.....	.....	.....	.....
		<i>x</i>	53.5 55.0 53.9	54.13	.....	.....	.....	.....
		<i>f</i>	32.0 32.6 31.8	32.13	.....	.....	.....	.....
		<i>e</i>	27.9 28.2 28.1	28.07	.....	.....	.....	.....
<i>h m</i> 18 14	22	<i>c</i>	18.6 18.2 17.2	18.00	.....	.....	.....	.....

TABLE 73.—7220 S CYGNI. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1904 October 28.			12-INCH.				Good.	
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3	Mean of 6.		H.	P.
<i>h m</i> 22 8	<i>°</i> 24	<i>m</i> <i>o</i> <i>d</i> <i>l</i> <i>T</i> <i>x</i> <i>j</i> <i>e</i> <i>c</i> <i>c</i> <i>e</i> <i>j</i> <i>x</i> <i>T</i> <i>l</i> <i>d</i> <i>o</i> <i>m</i>	30.3 30.9 30.8 36.5 37.1 36.3 12.9 14.1 13.3 29.6 29.7 29.1 12.4 12.7 13.0 41.7 41.4 41.6 21.3 22.7 21.8 17.8 18.3 19.0 12.5 11.8 12.0 11.5 11.4 12.0 18.0 18.3 18.2 23.1 22.8 23.3 41.2 41.5 42.1 14.0 14.2 13.7 30.3 29.4 29.1 14.7 15.3 15.2 36.5 37.2 36.9 31.8 31.7 30.9	30.67 36.63 13.43 29.47 12.70 41.57 21.93 18.37 12.10 11.63 18.17 23.07 41.60 13.97 29.60 15.07 36.87 31.47	31.07 36.75 14.25 29.54 13.34 41.59 22.50 18.27 11.87	2.76 3.40 0.95 2.61 0.83 3.95 1.97 1.49 0.64	10.71 11.35 8.90 10.56 8.78 11.90 9.92 9.44 8.59	10.96 11.60 9.15 10.81 9.03 12.15 10.17 9.69 8.84
22 30	27							

1904 October 31.			Good, dull.					
<i>o</i> 14	40	<i>m</i> <i>o</i> <i>d</i> <i>l</i> <i>T</i> <i>x</i> <i>j</i> <i>e</i> <i>c</i> <i>c</i> <i>e</i> <i>j</i> <i>x</i> <i>T</i> <i>l</i> <i>d</i> <i>o</i> <i>m</i>	29.0 28.9 28.8 35.2 34.2 34.7 14.8 14.1 14.0 26.1 27.8 26.9 12.2 12.0 12.1 39.3 38.8 39.1 20.0 20.3 20.0 16.1 16.2 16.8 10.9 11.7 10.3 10.7 10.8 10.2 16.9 16.7 17.3 21.1 20.3 20.2 39.6 39.4 38.9 12.2 13.7 13.0 27.5 27.4 27.8 14.9 13.9 12.9 35.5 35.0 34.3 28.0 28.6 28.1	28.90 34.70 14.30 26.60 12.10 39.07 20.10 16.37 10.97 10.57 16.97 20.53 39.30 12.97 27.57 13.90 34.93 28.23	28.57 34.82 14.10 27.09 12.54 39.19 20.32 16.67 10.77	2.52 3.17 0.94 2.38 0.75 3.69 1.74 1.28 0.53	10.60 11.25 9.02 10.46 8.83 11.77 9.82 9.36 8.61	10.85 11.50 9.27 10.71 9.08 12.02 10.07 9.61 8.86
<i>o</i> 37	43							

1900 August 30.			40-INCH WEDGE II.				Low, seeing poor.	
<i>l</i> 40		<i>y</i> <i>a</i> <i>x</i> <i>o</i> <i>m</i>	30.5 32.8 31.6 46.5 50.5 48.3 26.8 25.2 27.1 22.8 23.7 26.5 18.0 20.7 18.4	31.63 48.43 26.37 24.33 19.03	-	3.05 4.84 2.43 2.16 1.35	12.40 14.19 11.77 11.51 10.70	12.65 14.44 12.03 11.76 10.95
2 20								

TABLE 73.—7220 S CYGNI. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1900 September 13.			40-INCH, WEDGE II				Good.	
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
h m 21 27	°	m	15.7 17.0 14.9	15.87	15.89	0.82	10.48	10.73
		o	22.3 21.9 22.4	22.20	21.74	1.77	11.43	11.68
		a	42.6 42.8 43.0	42.80	42.64	4.23	13.89	14.14
		y	30.9 31.0 31.8	31.23	30.77	2.94	12.60	12.85
		v	38.5 38.0 40.0	38.83	.....	3.80	13.46	13.71
		l	15.8 14.0 14.2	14.67	14.22	0.59	10.25	10.50
		x	26.1 24.2 25.2	25.17	25.74	2.33	11.99	12.24
		x	26.5 25.2 27.2	26.30	.....	.....	.....	.....
		l	15.1 13.2 13.0	13.77	.....	.....	.....	.....
		y	28.2 31.8 30.9	30.30	.....	.....	.....	.....
		a	42.5 41.9 43.0	42.47	.....	.....	.....	.....
		o	21.9 20.5 21.4	21.27	.....	.....	.....	.....
		m	16.9 15.5 15.3	15.90	.....	.....	.....	.....
22 6								
1902 November 3.			WEDGE V.				Poor, occasionally fair for a moment.	
o 55		n	31.8 32.9 33.6	32.77	34.60	3.15	11.24	11.49
		m	28.7 29.6 30.2	29.50	29.22	2.57	10.66	10.91
		o	38.4 38.5 38.0	38.30	37.20	3.45	11.54	11.79
		l	49.5 49.3 50.0	49.60	49.65	4.77	12.86	13.11
		a	58.6 59.8 59.4	59.27	59.02	5.45	13.54	13.79
		y	41.3 41.8 42.3	41.80	40.87	3.86	11.95	12.20
		v	18.4 19.0 19.2	18.87	19.00	1.59	9.68	9.93
		x	38.2 40.3 40.1	39.53	39.22	3.69	11.78	12.03
		l	25.3 26.1 25.7	25.70	26.10	2.30	10.39	10.64
		l	26.3 26.9 26.3	26.50	.....	.....	.....	.....
		x	39.0 38.5 39.2	38.90	.....	.....	.....	.....
		v	18.6 19.0 19.8	19.13	.....	.....	.....	.....
		y	39.8 40.2 39.8	39.93	.....	.....	.....	.....
		a	56.8 59.8 59.7	58.77	.....	.....	.....	.....
		t	48.4 50.8 49.9	49.70	.....	.....	.....	.....
		o	36.2 35.8 36.3	36.10	.....	.....	.....	.....
		m	28.2 30.2 28.4	28.93	.....	.....	.....	.....
		n	36.9 36.2 36.2	36.43	.....	.....	.....	.....
1905 January 3.							Good.	
1 35		m	14.8 15.8 15.3	15.30	15.68	1.15	10.67	10.92
		o	21.4 22.4 22.4	22.07	22.84	2.01	11.53	11.78
		a	45.6 47.2 47.7	46.50	46.12	4.45	13.97	14.22
		y	32.9 31.7 30.7	31.77	30.52	2.76	12.28	12.53
		o	57.1 57.7 58.0	57.60	58.40	5.42	14.94	15.19
		v	58.1 58.4 58.0	58.17	58.54	5.43	14.95	15.20
		y	51.3 49.1 50.7	50.37	50.12	4.82	14.34	14.59
		x	24.2 25.1 25.3	24.87	25.72	2.27	11.79	12.04
		x	27.0 26.0 26.7	26.57	.....	.....	.....	.....
		y	49.0 50.4 50.2	49.87	.....	.....	.....	.....
		v	58.5 59.8 58.4	58.90	.....	.....	.....	.....
		o	59.3 59.3 59.0	59.20	.....	.....	.....	.....
		y	28.4 30.1 29.3	29.27	.....	.....	.....	.....
		a	45.0 46.2 46.0	45.73	.....	.....	.....	.....
		o	23.1 23.7 24.0	23.60	.....	.....	.....	.....
1 54								
54								

TABLE 73.—7220 S CYGNI. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1905 November 18.			40-INCH, WEDGE V.				Good.	
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
h m 6 30		x	19.3 20.1 20.0	19.80	19.25	1.62	11.95	12.20
		y	42.0 42.8 44.2	43.00	42.10	4.01	14.34	14.59
		z	54.1 56.6 53.1	54.60	54.04	5.15	15.48	15.73
		y	21.0 20.7 20.7	20.80	20.86	1.80	12.13	12.38
		a	40.5 40.1 40.1	40.43	39.76	3.75	14.08	14.33
		o	15.5 15.9 15.8	15.73	15.36	1.16	11.49	11.74
		t	33.6 32.1 32.8	32.83	32.46	2.90	13.23	13.48
		t	32.1 32.0 32.2	32.10	.....	.....	.....	.....
		o	14.0 15.7 15.3	15.00	.....	.....	.....	.....
		a	36.8 41.3 39.8	39.30	.....	.....	.....	.....
		y	20.8 20.9 21.1	20.93	.....	.....	.....	.....
		s	52.1 53.7 54.6	53.47	.....	.....	.....	.....
		y	39.9 42.3 41.4	41.20	.....	.....	.....	.....
		x	18.7 18.3 19.1	18.70	.....	.....	.....	.....
	6 50							

TABLE 74.—7220 S CYGNI. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

6-INCH.															
Star.	1904 September 3.					1904 September 5.					1904 October 1.				
	C.	Obs. Mag.		Δ Mag.		C.	Obs. Mag.		Δ Mag.		C.	Obs. Mag.		Δ Mag.	
		H.	P.	H.	P.		H.	P.	H.	P.		H.	P.		
B	0.30	7.23	7.48	+ .15	+ .01	0.34	7.30	7.55	+ .22	+ .08	0.45	7.33	7.58	+ .25	+ .11
C	0.51	7.44	7.69	— .44	— .27	0.65	7.61	7.86	— .27	— .10	0.67	7.55	7.80	— .33	— .16
D	0.40	7.33	7.58	+ .29	+ .26	0.12	7.08	7.33	+ .04	+ .01	0.22	7.10	7.35	+ .06	+ .03
Means	0.40	7.33	7.58	± .29	± .18	0.37	7.33	7.58	± .18	± .06	0.45	7.33	7.58	± .21	± .10
M ₀...	.....	6.93	7.18	.....	...	.....	6.96	7.21	.....	.....	.....	6.88	7.13	.....	.....

12-INCH.					40-INCH.					
Star.	Mag. 6-inch.	C.			Star.	Mag. 12-inch.	C.			
		Aug. 13.	Oct. 28.	Oct. 31.			Nov. 3.	Jan. 3.	Aug. 30.	Sept. 13.
c.....	8.60	1.41	0.64	0.53	l.....	10.53	....	....	....	0.59
d.....	9.03	2.02	0.95	0.94	.m.....	10.73	2.57	1.15	1.35	0.82
e.....	9.26	2.37	1.49	1.28	o.....	11.32	3.45	2.01	2.16	1.77
j.....	9.79	2.85	1.97	1.74	x.....	11.95	3.69	2.27	2.43	2.33
T.....	8.97	1.96	0.83	0.75						
Mean C...	....	2.12	1.18	1.05	Mean C...	.....	3.24	1.81	1.98	1.47
Mean Mag.	9.13	9.13	9.13	9.13	Mean Mag.	11.13	11.33	11.33	11.33	11.13
M ₀.....	....	7.01	7.95	8.08	M ₀.....	.....	8.09	9.52	9.35	9.66

TABLE 75.—7220 S CYGNI. MEAN MAGNITUDES OF COMPARISON STARS.

6-INCH.										
Star.	September 3.		September 5.		October 1.		Mean.			
	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag. H.	Mag. P.	Δ Mag.	
<i>B</i>	7.23	−0.06	7.30	+0.01	7.33	+0.04	7.29	7.54	±0.04	
<i>C</i>	7.44	−0.09	7.61	+0.08	7.55	+0.02	7.53	7.78	±0.06	
<i>D</i>	7.33	+0.16	7.08	−0.09	7.10	−0.07	7.17	7.42	±0.11	
Mean.	.....		.....		.....		7.33	7.58	±0.07
<i>c</i>	8.62	+0.02	8.62	+0.02	8.56	−0.04	8.60	8.85	±0.03	
<i>d</i>	9.05	+0.02	9.02	−0.01	9.02	−0.01	9.03	9.28	±0.01	
<i>e</i>	9.32	+0.06	9.18	−0.08	9.28	+0.02	9.26	9.51	±0.05	
<i>f</i>	9.70	−0.09	9.80	+0.01	9.86	+0.07	9.79	10.04	±0.06	
<i>T</i>	9.06	+0.09	8.96	−0.01	8.89	−0.08	8.97	9.22	±0.06	
Mean.	.....		.....		.....		9.13	9.38	±0.04
12-INCH.										
Star.	August 13.		October 28.		October 31.		Mean.			
	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag. H.	Mag. P.	Δ Mag.	
<i>c</i>	8.42	−0.12	8.59	+0.05	8.61	+0.07	8.54	8.79	±0.08	
<i>d</i>	9.03	+0.05	8.90	−0.08	9.02	+0.04	8.98	9.23	±0.06	
<i>e</i>	9.38	−0.01	9.44	+0.05	9.36	−0.03	9.39	9.64	±0.03	
<i>f</i>	9.86	−0.01	9.92	+0.05	9.82	−0.05	9.87	10.12	±0.04	
<i>T</i>	8.97	+0.11	8.78	−0.08	8.83	−0.03	8.86	9.11	±0.07	
Mean.	.....		.....		.....		9.13	9.38	±0.06
<i>l</i>	10.56	+0.03	10.56	+0.03	10.46	−0.07	10.53	10.78	±0.04	
<i>m</i>	10.89	+0.16	10.71	−0.02	10.60	−0.13	10.73	10.98	±0.10	
<i>o</i>	11.36	+0.04	11.35	+0.03	11.25	−0.07	11.32	11.57	±0.05	
<i>x</i>	12.17	+0.22	11.90	−0.05	11.77	−0.18	11.95	12.20	±0.15	
Mean.	.....		.....		.....		11.13	11.38	±0.08
40-INCH.										
Star.	August 30.		September 13.		November 3		January 3.		Mean.	
	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag. H.	Mag. P.
<i>l</i>	10.25	−0.07	10.39	+0.07	10.32	10.57
<i>m</i>	10.70	+0.07	10.48	−0.15	10.66	+0.03	10.67	+0.04	10.63	10.88
<i>o</i>	11.51	+0.01	11.43	−0.07	11.54	+0.04	11.53	+0.03	11.50	11.75
<i>x</i>	11.77	−0.06	11.99	+0.16	11.78	−0.05	11.79	−0.04	11.83	12.08
Mean.		11.07	11.32
<i>y</i>	12.40	+0.09	12.60	+0.29	11.95	−0.36	12.28	−0.03	12.31	12.56
<i>a</i>	14.19	+0.29	13.89	−0.01	13.54	−0.36	13.97	+0.07	13.90	14.15
<i>t</i>	12.86	(12.86	13.11
<i>θ</i>	14.94	(14.94	15.19
<i>γ</i>	14.34	(14.34	14.59

Also δ , 1905 November 18, 15.48 and 15.73.

TABLE 76.—7220 S CYGNI. VISUAL OBSERVATIONS OF THE VARIABLE.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
1	1892 Dec. 14	9	2410000+ 2447.63	60	6	v½ to 1 ^m fainter than d		....	9.5	poor	0	-0.74
2	1893 Jan. 7	7	2471.52	...	6	{m4v, v2l, limit p. } {n2m, d3e, e4f, g1f, f3h...}	21.1, 27.7	23.9	11.06	....	24	+0.31
3	July 2	10	2647.67	...	6	v not seen, p easy		<22	>11.5	....	200	....
4	3	10	2648.67	...	6	v not seen, p easy		<22	<11.5	....	201	....
5	Aug. 3	9	2679.63	...	6	{e2f, g1f, f3h, h4k, k1l... } v not seen, a3b, b2c, c1d, d2e {l2o, p not seen, m and n=f}		<22	<11.5	good	...	....
6	11	9	2683.61	...	6	v not seen, o easy, limit p		<22	<11.5	....	...	....
7	17	10	2689.66	150	6	v not seen, p easy, q glimpsed		<20	<12	....	...	....
8	Sept. 4	8	2711.58	150	6	p2-3v, vx, limit v	19.3, 19.0	19.2	11.92	fair	264	+0.19
9	6	9	2713.60	150	6	p2v, xv	19.8, 19.0	19.4	11.89	....	266	+0.19
10	13	8	2720.58	150	6	p2v, v1x	19.8, 20.0	19.9	11.80	....	273	+0.28
11	26	8	2733.58	150	6	vp, o1v, v2x	21.8, 21.0, 21.0	21.3	11.52	....	286	+0.36
12	Oct. 4	8	2741.56	40	6	v1p, l1v, l2p, o not seen	22.8, 24.7	23.8	11.27	....	294	+0.31
13	10	8	2737.56	40	6	{g2f, f3h, h4k } {a4b, b3c, c2d, d2e, e3f, e1g } {n2o, pn, p4-5q, limit q... } f3h, h2k, k2l, l2m, m3n... {vl, or v1l, k1v, v2m... }	26.2, 27.7, 26.1	26.7	10.63	fine	300	-0.02
14	21	7	2758.52	40	6	f2v, v2h	30.1, 30.6	30.4	10.03	good	311	-0.28
15	29	6	2766.50	150	6	f3v, v2h	29.1, 30.6	29.8	10.14	good	319	-0.08
16	Nov. 3	7	2771.51	150	6	f4-5v, v2h	27.6, 30.6	29.1	10.23	good	324	+0.01
17	6	8	2774.60	150	6	f4v, v2h	28.1, 30.6	29.4	10.19	fine	0	-0.05
18	9	6	2777.52	40	6	{a4b, b1c, c2d, d2e, e4f, g1f, } f4h, h1k, l2k, k3m, m2n, {n2o, o1p, limit p... } {poor p1o, o2q, limit q, r } not seen	29.1, 29.6, 30.7, 28.2	29.4	10.19	fair	3	-0.09
19	14	8	2782.56	10	1.3	{f3v, v1h, v2k, v2-3l... } a3b, b2c, c1d, d7e, limit e	28.6, 28.7, 29.1, 27.2 } 29.1, 27.6, 28.7, 26.7 }	28.2	10.40	fair	8	+0.07
20	16	7	2784.54	150	6	f4v, v1h, v1k, v2l	28.1, 29.6, 29.7, 27.7	28.8	10.30	moon	10	-0.07
21	20	7	2788.54	150	6	v1l, vk, h1v	26.7, 28.7, 27.6	27.7	10.46	moon	14	0.00
22	25	6	2793.50	150	6	vl, k1v, k2v, v3m	25.7, 27.7, 26.6, 27.1	26.8	10.60	fair	19	0.00
23	29	6	2797.51	150	6	vl, k2v, h2-3v, v2m	25.7, 26.7, 26.1, 26.1	26.2	10.70	good	23	-0.02
24	Dec. 1	8	2799.58	150	6	vl, k1v, v2m	25.7, 27.7, 26.1	26.5	10.65	poor	25	-0.15
25	3	7	2801.54	150	6	l0-1v, k1v, k2v, v2m	25.2, 27.7, 26.6, 26.1	26.4	10.66	fine	27	-0.21
26	5	6	2803.51	150	6	l1-2v, v2m	24.2, 26.1	25.2	10.88	fine	29	-0.05
27	8	6	2806.50	150	6	l2v, m1v, v3o, limit 1-2 < q	23.7, 23.1, 25.0	23.9	11.08	good	32	+0.03
28	12	6	2810.49	150	6	l2-3v, m1v, v3o	23.2, 23.1, 25.0	23.8	11.10	good	36	-0.19
29	17	7	2815.55	150	6	l3-4v, m1-2v, v1-2o	22.2, 22.6, 23.5	22.8	11.27	good	41	-0.25
30	28	7	2826.54	150	6	vx = limit		19.0	11.95	fair	52	-0.14
31	1894 Jan. 10	7	2839.52	...	6	x seen, v not seen		<19	<12.0	fair	...	....
32	June 6	10	2986.67	150	6	v not seen, limit x		<19	<12.0	good	...	....
33	20	10	3000.67	150	6	v not seen, limit 2 < x		<17	<12.3	fine	...	....
34	24	10	3004.67	150	6	v glimpsed, x2-3v		16.5	12.38	good	230	-0.19
35	28	10	3008.67	150	6	v glimpsed, x3v		16.0	12.48	good	234	+0.03
36	July 2	10	3012.67	150	6	v not held, limit 2 < x, x2y		<17.0	<12.3	good	...	....
37	8	9	3018.63	150	6	x2v, vy, uncertain	17.0, 16.4	16.7	12.35	good	244	+0.18
38	23	10	3033.67	...	6	x2v, y1v, limit v	17.0, 15.4	16.2	12.46	fair	259	+0.63
39	29	9	3039.63	150	6	x0-1v, v1-2y	18.5, 17.9	18.2	12.10	good	265	+0.39
40	Aug. 6	9	3047.63	150	6	l4-5v, v2-3x	21.2, 21.5	21.3	11.51	good	273	-0.02
41	8	9	3049.63	150	6	l5v, v2x	20.7, 21.0	20.8	11.61	fair	275	+0.11
42	18	9	3059.63	150	6	l2v, v1-2o	23.7, 23.5	23.6	11.13	fair	285	-0.12
43	20	9	3061.63	150	6	l2v, v2-3o	23.7, 24.5	24.1	11.05	fair	287	+0.14

TABLE 76.—7220 S CYGNI. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day, G. M. T.					Steps.	Mag.			
	1895		2410000+									
44	June 1	9	3349.63	150	6	v glimpsed, vx		19.0	11.95	good	248	-0.11
45	13	9	3358.63	150	6	v4x, l1-2v	23.0, 24.2	23.6	11.12	good	257	-0.75
46	20	9	3365.63	150	6	v5-6x		24.5	10.97	good	264	-0.78
	1898											
47	June 25	11	4466.71	80	12	x4y, y1v, w2y		15.4	12.57	....	57	+0.24
48	July 6	10	4477.67	275	12	y2v, limit v		14.4	12.75	poor	68	-0.13
49	25	11	4496.71	275	12	{ y8v, limit 1 < v angle ydv is a right angle }		8.4	13.90	good	87	+0.19
50	Aug. 8	10	4510.67	275	12	y8v, limit v		8.4	13.90	good	101	-0.21
51	20	9	4522.63	275	12	v not seen, limit 3-4 < y		< 13	< 13.0	fair	...	....
	1900											
52	June 28	..	5199	237	40	{ y10v, β4y, v1a, v1y δ is 16 magnitude, ε is 17 magnitude. }	6.4, 7.9, 10.4, 6.7..	7.8	14.02	....	136	-0.51
53	July 20	12	5221.75	237	40	y7a, a4-5v, limit v		4.9	14.60	fine	158	+0.15
54	Aug. 16	10	5248.67	460	40	δ (is it δ or v) limit		< 0	< 15.6	fair	...	....
55	29	..	5261	...	..	a5-6v, v2-3δ, v0-1v	2.8, 2.0, 4.3	3.0	14.99	....	207	+1.19
56	30	..	5262	...	..	v is < a (photometer.....)		< 9	< 13.9	poor	...	....
57	Sept. 12	10	5275	75	12	v not seen, limit 4 < x, (y glimpsed.....)		< 15	< 12.7	moon	...	....
58	13											
59	13		5276.67	237	40	y5v, v8, v5v (t = a±).....	11.4, 9.4, 9.8.....	10.2	13.52	good	213	+0.23
60	13	10										
61	Oct. 4		5297.67	237	40	x3-4v, v2y.....	15.5, 18.4	17.0	12.30	fair	234	-0.13
62	.....					{ v1y, x2-3v, y1l, a6v, v4δ } limit δ.	17.4, 16.5	17.0	12.30	fair	246	+0.21
63	16	10	5309.67	460	40	{ o4v, x1v, v1y, limit y... l is 11th mag. or brighter, (l' is 11½M.....)	18.0, 18.0, 17.4....	17.8	12.18	fine	253	+0.23
64	26	6	5319.50	150	6	m4v, o1v, v3x	20.1, 21.0, 22.0....	21.0	11.59	fair	282	+0.24
65	Nov. 21	6	5345.50	150	6							
66	1901 Oct. 18	..	5666	...	12	vl.....		25.7	10.79	good	276	-0.70
	1902											
67	Mar. 15	16	5824.92	237	40	a3v, vθ.....	6.4, 2.3	4.4	14.68	poor	107	+0.46
68	Oct. 29	10	6052.67	75	12	f2v, vl.....	30.1, 25.7	27.9	10.37	fair	8	+0.04
69	..	..	.....	...	..	photometer.....						
70	30	..	6053.67	75	12	photometer.....						
71	31	9	6054.63	237	40	a2v, γ near limit		...	10.32	good	9	-0.04
72	Nov. 3	9	6056.63	237	40	photometer.....		...	9.68	poor	12	-0.72
73	19	8	6072.58	75	12	photometer.....		...	11.03	good	28	+0.13
74	24	9	6077.63	...	24	photograph.....		...	11.9	good	33	....
75	Dec. 26	7	6110.54	237	40	y1-2v, v4l	14.9, 14.6	14.8	12.70	....	66	-0.10
	1903											
76	Jan. 17	6	6132.50	460	40	y8v, t1v, v2a, v6-8v.....	8.4, 9.6, 11.4, 12.7	10.5	13.50	fair	88	-0.27
77	Mar. 20	17	6194.96	237	40	v not seen, limit a		< 9	< 13.8	....	...	....
78	Apr. 3	14	6208.83	237	40	v not seen, limit δ, γ and θ seen.		< 0	< 15.6	....	...	....
	1904											
79	July 27	10	6689.67	...	24	photograph.....		...	10.5	fair	...	....
80	31	12	6695.75	...	..	v4l.....		29.7	10.16	good	322	-0.06
81	Aug. 27	8	6720.58	...	..	m6v, v10, v6x	18.1, 23.0, 25.0	22.4	11.30	good	22	+0.61
82	Sept. 3	10	6727.67	40	6	o1-2v, v1x	20.5, 20.0	20.2	11.71	good	29	+0.80
83	Oct. 1	9	6755.63	40	6	v not seen, x seen		< 19	< 12.0	good	...	....
84	8	9	6762.63	237	40	y5v, v1t	11.4, 11.6	11.5	13.32	fair	64	+0.62

TABLE 76.—7220 S CYGNI. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
85	1904 Oct. 28	..	2410000+	67	12	v not seen, limit γ		< 16.4	< 12.4	good	...	....
86	Nov. 6	11	6782 6791.71	237	40	α2v, v1γ, v6δ	7.4, 6.7, 5.5.....	6.5	14.29	fair	93	+0.34
87	1905 Jan. 3	6	6849.50	237	40	α8v, v3θ, v3δ	1.4, 3.3, 2.5.....	2.6	15.00	good	151	+0.49
88	3	7	6849.54	237	40	photometer						
89	24	6	6870.50	450	40	v not seen, α glimpsed		< 6	< 14.4	dull	...	....
90	28	7	6874.52	450	40	18-10v, v3-4α, v6γ	6.1, 11.4, 8.7.....	8.7	13.87	good	176	-0.28
91	Feb. 14	16	6891.92	250	40	γ6-7v, v11	9.9, 11.6.....	11.1	13.39	good	193	-0.41
92	Mar. 24	17	6929.95	150	6	03-4v, v1x	19.0, 20.0.....	19.5	11.85	haze	245	-0.32
93	Apr. 4	16	6940.92	237	40	15v, vx, v4-5γ	17.0, 19.0, 20.4....	18.8	11.98	...	256	+0.03
94	30	15	6966.88	237	40	v1-2x, v61 ?	20.5, (16.6)	20.5	11.66	good	282	+0.26
95	May 31	9	6977.63	150	6	f2v, v5-61 (γ seen)	30.1, 31.2.....	30.5	10.00	fair	313	-0.25
96	June 22	9	7019.63	150	6	v1, v1m, v3n	25.7, 25.1, 26.6....	25.6	10.80	good	9	+0.50
97	July 26	9	7053.63	150	6	02-3v, v2x	19.5, 21.0.....	20.2	11.72	fair	43	+0.23
98	Aug. 9	9	7067.63	150	6	x3-4v, v2-3γ	15.5, 18.4.....	17.0	12.30	good	57	+0.29
99	20	9	7078.62	237	40	γ5-6v, v21	10.9, 12.6.....	11.8	13.28	poor	68	+0.77
100	22	9	7080.63	237	40	x8-10v, γ3v, v41	10.0, 13.4, 14.6....	13.0	13.01	good	70	+0.36
101	Sept. 2	11	7091.71	237	40	14-5v, v6γ, v8θ	6.1, 11.7, 8.3.....	8.0	13.97	good	81	+0.87
102	19	7	7108.54	237	40	15v, v2γ	5.6, 7.7.....	7.0	14.16	good	98	+0.46
103	Oct. 1	10	7120.67	750	40	v not seen, limit γ		< 5.7	< 14.4	poor	...	....
104	21	9	7140.63	750	40	γ6-8v, θv, v4δ ±	-1.3, 0.3, 3.5.....	1.2	15.30	good	130	+0.68
105	Nov. 18	6	7168.51	450	40	δ5-6v		- 6.0	16.5	good	158	+2.0
106	Dec. 30	6	7210.51	750	40	v6δ, γ3-4v	5.5, 9.2.....	7.9	14.00	good	200	+0.10

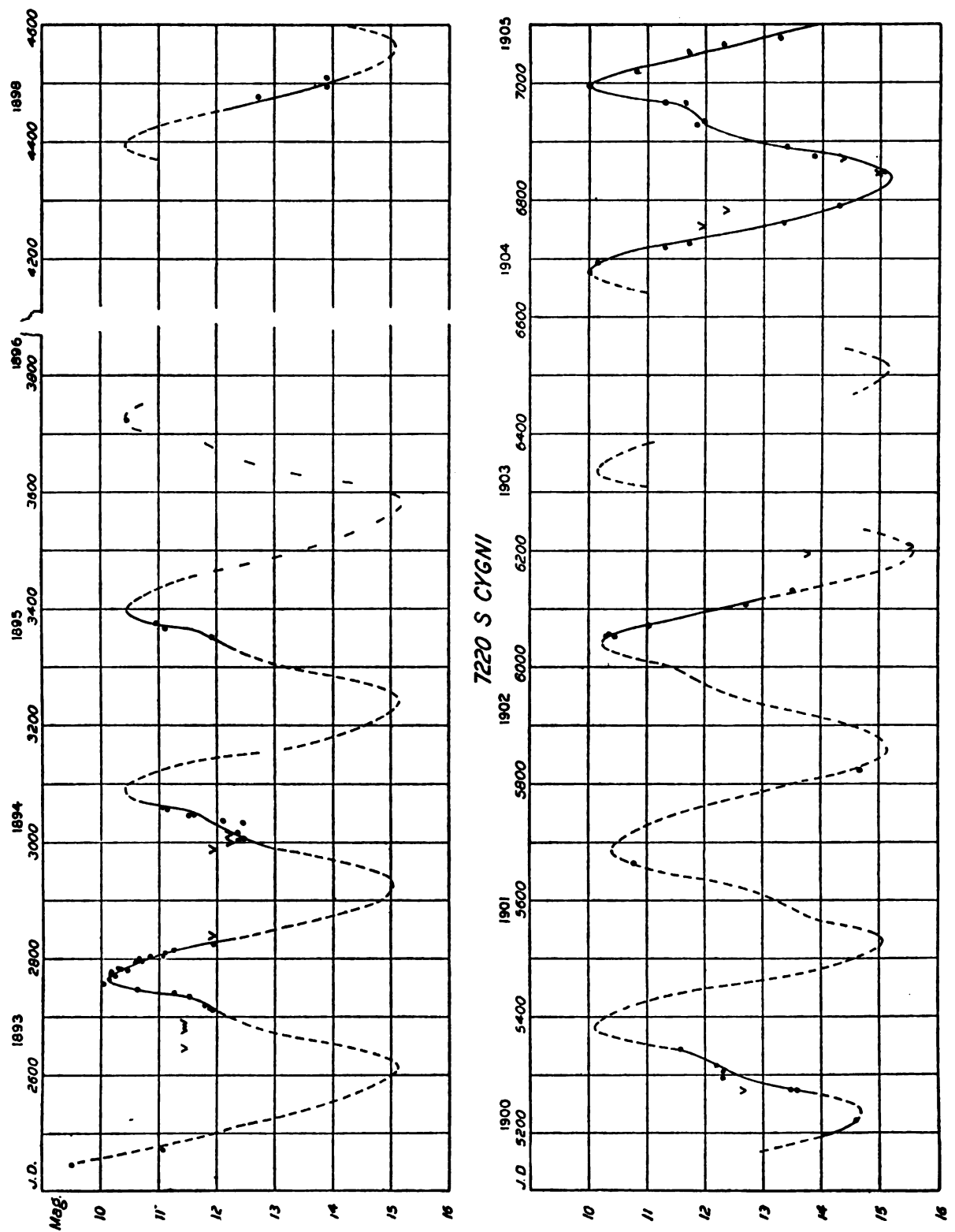


FIG. 26 —LIGHT-CURVE OF S CYGNI.

TABLE 77.—7220 S CYGNI. MEAN MAGNITUDES FROM 27½ DAY GROUPS.

Group No.	1	2	3	4	5	6	7	8	9	10	11	12
J. D.	27	54	82	109	136	163	190	217	244	272	299	326
2447 {	<i>t</i>	12	....	....	....	....	....	....	....	265	284	314
	<i>M</i>	10.28	....	....	....	....	....	....	....	11.90	11.53	10.26
	<i>ΔM</i>	-0.18	....	....	....	....	....	....	....	+0.10	+0.27	-0.08
	No.	2	....	....	....	....	....	....	....	2	3	4
2773 {	<i>t</i>	14	38	....	....	....	....	....	233	257	281	....
	<i>M</i>	10.44	11.13	....	....	....	....	....	12.43	12.30	11.32	....
	<i>ΔM</i>	-0.01	-0.02	....	....	....	....	....	-0.04	+0.39	-0.08	....
	No.	8	6	....	....	....	....	....	2	3	4	....
3099 {	<i>t</i>	....	....	....	....	....	....	....	....	257	....	....
	<i>M</i>	....	....	....	....	....	....	....	....	11.35	....	....
	<i>ΔM</i>	....	....	....	....	....	....	....	....	-0.59	....	....
	No.	....	....	....	....	....	....	....	....	3	....	....
4402 {	<i>t</i>	....	....	70	101	....	....	....	....	....	....	....
	<i>M</i>	....	....	12.66	13.90	....	....	....	....	....	....	....
	<i>ΔM</i>	....	....	+0.10	+0.08	....	....	....	....	....	....	....
	No.	....	....	2	2	....	....	....	....	....	....	....
5054 {	<i>t</i>	....	....	....	....	145	167	....	232	258	291	....
	<i>M</i>	....	....	....	....	14.02	14.60	....	12.91	12.24	11.59	....
	<i>ΔM</i>	....	....	....	....	-0.87	-0.37	....	+0.31	+0.32	-0.59	....
	No.	....	....	....	....	1	1	....	2	2	1	....
5716 {	<i>t</i>	....	....	....	118	....	....	....	....	....	286	....
	<i>M</i>	....	....	....	14.68	....	....	....	....	....	10.79	....
	<i>ΔM</i>	....	....	....	+0.37	....	....	....	....	....	-0.56	....
	No.	....	....	....	1	....	....	....	....	....	1	....
6032 {	<i>t</i>	22	40	78	90	....	....	....	....	....	....	....
	<i>M</i>	10.21	11.03	12.70	13.50	....	....	....	....	....	....	....
	<i>ΔM</i>	-0.40	-0.26	-0.28	+0.07	....	....	....	....	....	....	....
	No.	3	1	1	1	....	....	....	....	....	....	....
6684 {	<i>t</i>	5	40	92	....	....	165	198	....	....	....	....
	<i>M</i>	10.16	11.50	13.80	....	....	15.00	13.63	....	....	....	....
	<i>ΔM</i>	-0.13	+0.24	+0.32	....	....	0.00	-0.44	....	....	....	....
	No.	1	2	2	....	....	1	2	....	....	....	....
7010 {	<i>t</i>	....	....	....	....	....	....	....	....	....	....	....
	<i>M</i>	....	....	....	....	....	....	....	....	....	....	....
	<i>ΔM</i>	....	....	....	....	....	....	....	....	....	....	....
	No.	....	....	....	....	....	....	....	....	....	....	....
Mean ^s {	<i>t</i>	15	39	80	94	118	145	166	198	232	259	284
	<i>M</i>	10.35	11.20	13.13	13.77	14.68	14.02	14.80	13.63	12.67	11.92	11.36
	<i>ΔM</i>	-0.13	+0.01	+0.11	+0.08	+0.37	-0.87	-0.18	-0.44	+0.14	+0.02	+0.06
	No.	14	9	5	3	1	1	2	2	4	10	9

TABLE 78—7220 S CYGNI. OBSERVED MAXIMA AND MINIMA.
Elements of maximum. 1893 October 26 (J. D. 2412768) + 826^d (R - 83). M - m = 162^d.

MAXIMA.							MINIMA.						
Epoch.	Date.		Mag.		Corr.	Wt.	Epoch.	Date.		Mag.		Corr.	Wt.
	Calendar.	J. D.	H.	P.				Calendar.	J. D.	H.	P.		
32	1893 Oct. 26	2763	10.10	10.35	- 2	33	32	1893 May 19	2603	....	mc	0	1
33	1894 Sept. 20	3092	....	mc	+ 1	5	33	1894 Apr. 6	2925	....	mc	- 4	2
34	1895 July 25	3400	....	mc	- 17	2	34	1895 Feb. 15	3240	....	mc	- 15	1
37	1898 Apr. 16	4396	....	mc	+ 1	1	38	1898 Sept. 25	4558	....	mc	- 1	4
40	1900 Dec. 27	5381	....	mc	+ 8	6	40	1900 July 29	5230	....	mc	+ 19	8
41	1901 Nov. 1	5690	10.4	10.6	- 9	1	42	1902 Apr. 20	5860	....	mc	- 3	1
42	1902 Oct. 17	6040	10.2	10.5	+ 15	4	43	1903 Mar. 26	6200	15.6	15.8	+ 13	4
44	1904 July 18	6680	10.0	10.3	+ 3	4	45	1904 Dec. 25	6840	15.2	15.4	+ 1	13
45	1905 May 29	6995	10.06	10.31	+ 8	12	46	1905 Nov. 18	7168	16.5	16.8	+ 3	8

TABLE 79.—COMPARISON OF PHOTOMETRIC MAGNITUDES.

Star.	H. C. O. Vol. 37.	H. M. Parkhurst.	J. A. Parkhurst.		Star.	H. C. O. Vol. 37.	H. M. Parkhurst.	J. A. Parkhurst.	
			H.	P.				H.	P.
a	7.78	7.93	7.53	7.78	l	....	11.19	10.53	10.78
c	8.76	8.99	8.54	8.79	m	11.62	....	10.73	10.98
d	9.18	9.25	8.98	9.23	o	12.14	....	11.32	11.57
e	9.43	9.66	9.39	9.64	x	12.90	....	11.95	12.20
f	....	10.27	9.87	10.12	y	....	13.48	12.31	12.56

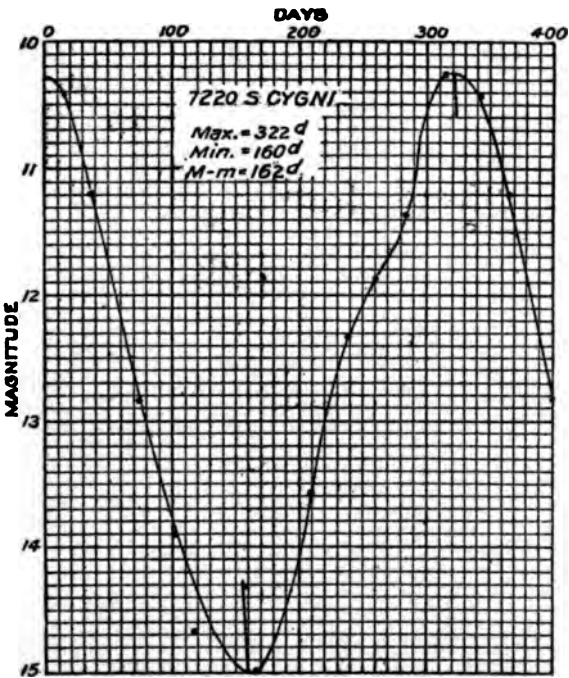


FIG. 27.—MEAN LIGHT-CURVE OF S CYGNI.

The mean light-curve was derived from observations as far as 1905 March 24. It shows a steady and rapid decline, with a well-defined minimum, a halt in the rise at about 12th magnitude, and a maximum about as sharp as the minimum. The halt in the rise is referred to by Townley as a double maximum, but nothing is shown of it in the mean light-curve published in the *Harvard Annals* 37, Plate III. In the light-curve, fig. 26, this halt is shown before the maxima of epochs 32, 33, 34, 40, and 45. At the other maxima the observations are too few to furnish evidence.

LATER NOTE.—It was possible to observe the minimum, epoch 46, in the fall of 1905, in better conditions than any previous one. Advantage was taken of an unusually clear night, November 18, to secure photometer measures of the faint comparison star δ with the result, 15.48 and 15.73, on the Harvard and Potsdam scales, respectively. The variable was then 16½ (corresponding to 16½ on the Potsdam scale), the faintest ever observed.

The difference in scale is very noticeable in Table 79; as compared with mine, the Harvard and H. M. Parkhurst scales are respectively 15 and 16 per cent more extended. The reasons for this discordance are not clear, but it should be noted that the measures of the faint stars in the Harvard list all depend on the single star a ($=C$ of Table 70, color GW), too slender a basis it would seem, especially as the meridian photometer measures in Volume 44 of the *Annals* depend on three zones, one of which was interrupted and the other two stopped by clouds. It may also be said that the stars x and y were used with the 6-inch, which would make the limit of that instrument about 13.7 if the Harvard scale is accepted. Taking everything into account, it seems probable that the truth lies between the two scales.

CHAPTER X.

7269 SX CYGNI.

R. A. 20^h 11^m 33^s.2, Dec. +30° 45' 58" (1900).

This variable was discovered by Anderson in 1899 and observations began in October of that year, measurements being made of the place of the variable and the brighter comparison stars with the 6-inch. The place given above was derived from the Leyden A. G. stars *h* and *m* (= +30° 3962 and 3967), and is almost identical with that given by Hartwig, whose observations of the star's variations, not yet published, seem to be the only ones which will be available for comparison with the present series. In the *Vierteljahrsschrift* 39, 261, Hartwig derives the period 548 days from the interval between the maxima 1899 August 20 (J. D. 4887) and 1904 February 18 (J. D. 6529), using the divisor 3. Reference to the light-curve (fig. 29) shows that the divisor should be 4, which would give 410 days from the above maxima. This is in close agreement with the period 409 days, derived from the present series.

Consideration of the limits of visibility of the 6- and 12-inch, renders it probable that the photometric magnitudes of the stars fainter than *p* are about half a magnitude too small numerically, and therefore the minimum magnitude of the variable is nearer 14.0 on the Harvard, and 14.4 on the Potsdam scales.

TABLE 80.—7269 SX CYGNI. STANDARD MAGNITUDE STARS.

Star.	B. D. No.	1900.		Color P. DM.	Magnitude.				Residuals.		
		R. A.	Dec.		Catalogue.		Measured.		From Cats.		3 Nights inter se.
					H.C.O.	P.DM.	H.	P.	H.	P.	
<i>E</i>	°	<i>h m s</i>	° '								
<i>F</i>	+29 3948	20 10 15	+29 54.2	W	7.03	7.37	7.14	7.49	+11	+12	±7
<i>G</i>	+31 4001	20 10 17	+31 40.8	GW	7.38	7.58	7.19	7.54	-19	-4	±3
	+31 4020	20 12 55	+31 11.9	W	6.83	7.34	6.90	7.25	+7	-11	±4
	Mean	.....	.....	.....	7.08	7.43	7.08	7.43	±12	±9	±5

TABLE 81.—7269 SX CYGNI. COMPARISON STARS IN B. D. CATALOGUE.

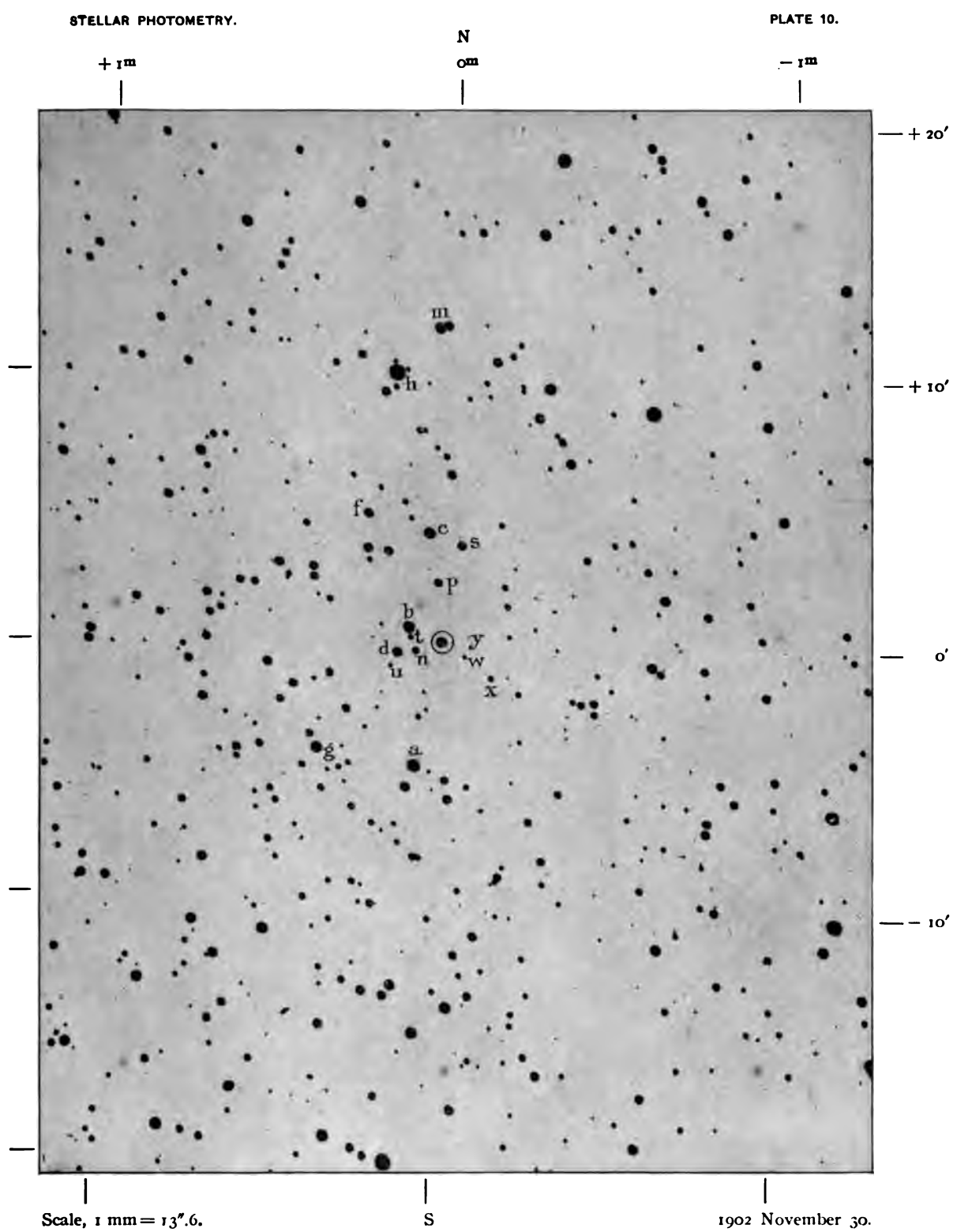
Star.	B. D.		1855.		Star.	B. D.		1855.	
	No.	Mag.	R. A.	Dec.		No.	Mag.	R. A.	Dec.
	°		<i>h m s</i>	° '		°		<i>h m s</i>	° '
<i>m</i>	+30 3962	8.8	20 9 48	+30 49.8	<i>h</i>	+30 3967	7.7	20 9 56	+30 47.6
<i>c</i>	+30 3963	9.3	20 9 48	+30 42.2	<i>l</i>	+30 3970	9.2	20 10 5	+30 2.6
<i>a</i>	+30 3964	9.1	20 9 49	+30 32.6	<i>k</i>	+30 3973	9.4	20 10 48	+30 1.9
<i>b</i>	+30 3965	9.4	20 9 50	+30 38.4					

TABLE 82.—COMPARISON STARS FOR 7269 SX CYGNI (IN ORDER OF RIGHT ASCENSION).

Star.	Coordinates from Variable.			Light Scale, Steps.	Magnitude.			
	R. A.		Dec.		Measured.		From Curve.	
					H.	P.	H.	P.
x	- 118	- 9.2	- 79	13.5	12.50	12.85	.....	.....
y	- 63	- 5.0	+ 17	7.0	13.54	13.89	.....	.....
w	- 55	- 4.3	- 32	10.0	13.15	13.50	.....	.....
s	- 37	- 2.9	+ 225	24.6	11.00	11.35	.....	.....
p	+ 17	+ 1.3	+ 140	22.4	11.79	12.14	.....	.....
z	+ 25	+ 1.9	+ 18	0.0	.....	.....	14.40	14.75
c	+ 30	+ 2.3	+ 252	38.0	9.61	9.96	.....	.....
a	+ 57	+ 4.4	+ 284	43.0	8.83	9.18	.....	.....
n	+ 59	+ 4.6	- 21	18.4	11.84	12.19	.....	.....
m	+ 33	+ 2.6	+ 722	32.5	9.44	9.79	.....	.....
t	+ 74	+ 5.7	+ 10	11.5	.....	.....	13.00	13.35
b	+ 78	+ 6.1	+ 32	36.2	9.87	10.22	.....	.....
d	+ 103	+ 8.0	- 26	31.3	10.50	10.85	.....	.....
u	+ 118	+ 9.1	- 57	10.5	.....	.....	13.13	13.48
h	+ 129	+ 10.0	+ 616	52.0	7.44	7.79	.....	.....
l	+ 179	+ 13.9	- 2043	36.6	.....	.....	9.65	10.00
i	+ 181	+ 14.0	+ 292	33.3	.....	.....	10.10	10.45
k	+ 259	+ 20.1	- 2124	37.6	.....	.....	9.51	9.86
g	+ 284	+ 22.0	- 251	34.2	.....	.....	9.98	10.33

TABLE 83.—7269 SX CYGNI. PHOTOMETER MEASURES OF COMPARISON STARS.

1904 September 5.			6-INCH.			Good, somewhat dull.		
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
h m 20 5	° 10	F	10.2 9.9 10.2	10.10	10.90	0.38	7.23	7.58
		G _{at}	12.5 13.1 13.0	12.87	.....	0.62	7.47	7.82
		c	29.7 29.6 29.1	29.47	30.64	2.76	9.61	9.96
		b	29.5 30.1 30.6	30.07	31.32	2.84	9.69	10.04
		a	23.5 22.8 23.3	23.20	23.50	1.98	8.83	9.18
		h	13.9 14.2 14.2	14.10	14.10	0.80	7.65	8.00
		E	9.6 9.8 9.2	9.53	9.83	0.27	7.12	7.47
		E	10.0 10.2 10.2	10.13	.....	.....	.....	.....
		h	13.8 14.0 14.5	14.10	.....	.....	.....	.....
		a	24.0 24.2 23.2	23.80	.....	.....	.....	.....
		b	32.1 32.6 33.0	32.57	.....	.....	.....	.....
		c	31.9 31.7 31.8	31.80	.....	.....	.....	.....
		G	9.4 9.0 8.4	8.93	.....	.....	.....	.....
		F	11.7 11.8 11.6	11.70	.....	.....	.....	.....
20 31	13							



7269 SX CYGNI.
R. A. 20^h 11^m 33^s.2. Dec. + 30° 45' 58", 1900.

TABLE 83.—7269 SX CYGNI. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1904 October 1.			6-INCH.				Good.	
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
<i>h m</i>	<i>°</i>							
22 4	26	<i>F</i>	9.2 10.2 9.2	9.53	9.58	0.25	7.14	7.49
		<i>G_{at}</i>	13.5 13.5 13.3	13.43	13.53	0.72	7.61	7.96
		<i>c</i>	29.7 30.9 30.0	30.20	30.30	2.72	9.61	9.96
		<i>b</i>	31.5 32.0 31.6	31.70	31.52	2.87	9.76	10.11
		<i>a</i>	26.4 26.2 26.3	26.30	25.02	2.13	9.02	9.37
	28	<i>E</i>	10.6 9.0 9.7	9.77	10.12	0.29	7.18	7.53
		<i>E_{at}</i>	16.6 15.9 16.0	16.17	.....	1.20	8.09	8.44
		<i>E</i>	10.2 10.2 11.0	10.47	.....	.....	.....	.....
		<i>a</i>	23.2 24.1 23.9	23.73	.....	.....	.....	.....
		<i>b</i>	31.0 31.1 31.9	31.33	.....	.....	.....	.....
	29	<i>c</i>	30.2 31.0 30.0	30.40	.....	.....	.....	.....
		<i>G_{at}</i>	13.0 14.1 13.8	13.63	.....	.....	.....	.....
		<i>F</i>	9.7 9.9 9.3	9.63	.....	.....	.....	.....
1904 October 2.			Good.					
22 5	27	<i>F_{at}</i>	13.5 13.9 14.0	13.80	14.19	0.81	7.95	8.30
		<i>G_{at}</i>	12.3 13.2 12.5	12.67	12.52	0.58	7.72	8.07
		<i>h</i>	10.4 10.0 9.3	9.90	10.15	0.29	7.43	7.78
		<i>c</i>	29.8 29.0 28.8	29.20	28.82	2.54	9.68	10.03
		<i>b</i>	30.0 31.0 30.2	30.73	30.30	2.75	9.89	10.24
		<i>a</i>	20.2 20.7 20.6	20.50	21.30	1.74	8.88	9.23
		<i>E_{at}</i>	12.5 13.8 13.1	13.13	13.25	0.67	7.81	8.16
		<i>E_{at}</i>	12.9 13.8 13.4	13.37	.....	.....	.....	.....
		<i>a</i>	22.1 21.9 22.3	22.10	.....	.....	.....	.....
		<i>b</i>	30.1 29.8 29.7	29.87	.....	.....	.....	.....
	29	<i>c</i>	28.9 27.9 28.5	28.43	.....	.....	.....	.....
		<i>h</i>	10.1 10.9 10.2	10.40	.....	.....	.....	.....
		<i>G_{at}</i>	12.4 12.3 12.4	12.37	.....	.....	.....	.....
1904 October 28.			12-INCH.				Good, moon rising at end.	
22 44	32	<i>m</i>	19.4 19.6 19.9	19.63	20.20	1.73	9.44	9.79
		<i>h_{at}</i>	9.8 10.1 9.7	9.87	10.47	0.49	8.20	8.55
		<i>c</i>	21.0 21.7 21.5	21.40	20.65	1.78	9.49	9.84
		<i>s</i>	36.1 35.9 35.9	35.97	35.69	3.27	10.98	11.33
		<i>p</i>	42.1 42.2 41.8	42.03	42.80	4.08	11.79	12.14
		<i>b</i>	27.8 26.7 26.0	26.83	26.37	2.31	10.02	10.37
		<i>d</i>	30.8 30.8 30.0	30.53	30.78	2.74	10.45	10.80
		<i>a</i>	14.0 15.3 14.1	14.47	15.24	1.09	8.80	9.15
		<i>a</i>	16.1 16.0 15.9	16.00	.....	.....	.....	.....
		<i>d</i>	31.9 31.1 30.1	31.03	.....	.....	.....	.....
	34	<i>b</i>	25.9 26.0 25.8	25.90	.....	.....	.....	.....
		<i>p</i>	43.9 43.7 43.1	43.57	.....	.....	.....	.....
		<i>s</i>	35.2 36.0 35.0	35.40	.....	.....	.....	.....
23 0	34	<i>c</i>	19.5 20.1 20.1	19.90	.....	.....	.....	.....
		<i>h_{at}</i>	11.1 11.2 10.9	11.07	.....	.....	.....	.....
		<i>m</i>	20.2 21.1 21.0	20.77	.....	.....	.....	.....

TABLE 83.—7269 SX CYGNI. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1904 November 1.			12-INCH.				Good.	
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
<i>h m</i> 22 20	<i>°</i> 28	<i>a</i>	20.0 19.3 19.8	19.70	19.52	1.65	8.81	9.16
		<i>d</i>	36.8 36.1 36.0	36.30	36.49	3.36	10.52	10.87
		<i>b</i>	29.2 28.9 29.7	29.27	29.55	2.61	9.77	10.12
		<i>p</i>	47.9 47.3 46.9	47.37	47.65	4.59	11.75	12.10
		<i>s</i>	38.9 39.1 39.7	39.23	40.30	3.81	10.97	11.32
		<i>c</i>	29.2 29.1 29.2	29.17	28.14	2.57	9.73	10.08
		<i>h_{at}</i>	15.7 15.8 14.6	15.37	.....	1.09	8.25	8.60
		<i>m</i>	26.9 26.7 25.7	26.43	.....	2.32	9.48	9.83
		<i>c</i>	27.2 26.8 27.3	27.10	.....	.....	.....	.....
		<i>s</i>	41.1 41.3 41.7	41.37	.....	.....	.....	.....
		<i>p</i>	47.7 47.8 48.3	47.93	.....	.....	.....	.....
		<i>b</i>	29.4 29.8 30.3	29.83	.....	.....	.....	.....
		<i>d</i>	35.7 36.9 37.4	36.67	.....	.....	.....	.....
		<i>a</i>	19.4 19.3 19.3	19.33	.....	.....	.....	.....
1904 November 3.			Good.					
<i>h m</i> 23 12	<i>°</i> 37	<i>m</i>	18.3 19.3 19.2	18.93	19.25	1.62	9.40	9.75
		<i>h_{at}</i>	10.1 10.2 11.2	10.50	11.49	0.60	8.38	8.73
		<i>c</i>	22.8 22.8 21.9	22.50	21.15	1.84	9.62	9.97
		<i>s</i>	36.1 36.0 36.0	36.03	35.80	3.28	11.06	11.41
		<i>p</i>	43.0 43.5 43.3	43.27	42.42	4.04	11.82	12.17
		<i>b</i>	21.9 22.7 22.6	22.40	23.12	2.04	9.82	10.17
		<i>d</i>	31.8 31.7 31.9	31.80	31.07	2.76	10.54	10.89
		<i>a</i>	15.7 15.1 15.6	15.47	15.49	1.11	8.89	9.24
		<i>a</i>	15.4 16.0 15.4	15.60	.....	.....	.....	.....
		<i>d</i>	30.4 30.2 30.4	30.33	.....	.....	.....	.....
		<i>b</i>	24.0 24.2 23.3	23.83	.....	.....	.....	.....
		<i>p</i>	41.6 41.9 41.2	41.57	.....	.....	.....	.....
		<i>s</i>	35.7 35.2 35.8	35.57	.....	.....	.....	.....
		<i>c</i>	20.0 20.0 19.4	19.80	.....	.....	.....	.....
		<i>h_{at}</i>	13.8 12.1 13.0	12.97	.....	.....	.....	.....
		<i>m</i>	19.0 19.7 20.0	19.57	.....	.....	.....	.....
1900 October 17.			40-INCH, WEDGE II. Images very large and unsteady.					
<i>h m</i> 24		<i>s</i>	22.0 20.1 20.0	20.70	20.09	1.72	10.88	11.23
		<i>p</i>	32.9 33.0 32.6	32.83	29.28	2.58	11.74	12.09
		<i>d</i>	18.8 19.6 19.2	19.20	18.47	1.51	10.67	11.02
		<i>n</i>	31.6 32.8 32.0	32.13	28.97	2.56	11.72	12.07
		<i>y</i>	48.2 50.0 48.0	48.73	44.92	4.31	13.47	13.82
		<i>w</i>	42.0 43.5 43.2	42.90	39.52	3.72	12.88	13.23
		<i>x</i>	34.1 35.8 37.2	35.70	34.67	3.16	12.32	12.67
		<i>x</i>	32.0 34.9 34.0	33.63	.....	.....	.....	.....
		<i>w</i>	37.4 35.0 36.0	36.13	.....	.....	.....	.....
		<i>y</i>	42.0 40.1 41.2	41.10	.....	.....	.....	.....
		<i>n</i>	25.9 27.7 23.8	25.80	.....	.....	.....	.....
		<i>d</i>	13.5 19.5 20.2	17.73	.....	.....	.....	.....
		<i>p</i>	26.8 24.5 25.9	25.73	.....	.....	.....	.....
		<i>s</i>	18.3 20.0 20.1	19.47	.....	.....	.....	.....

TABLE 83.—7269 SX CYGNI. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1902 October 24.			40-INCH, WEDGE V.				Seeing good.	
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
h m 21 30		s	15.8 17.0 17.8	16.87	18.44	1.50	10.96	11.31
		p	27.0 27.0 26.0	26.67	27.07	2.38	11.84	12.19
		d	14.0 12.6 13.3	13.30	14.29	1.03	10.49	10.84
		n	28.0 29.2 29.4	28.87	29.00	2.55	12.01	12.36
		v	25.7 24.8 24.9	25.13	.....	2.21	11.67	12.02
		y	43.0 43.2 43.6	43.27	44.00	4.21	13.67	14.02
		w	40.8 40.3 40.0	40.27	40.25	3.80	13.26	13.61
		x	34.5 34.3 34.2	34.33	34.48	3.13	12.59	12.94
		x	34.4 34.5 35.0	34.63	.....	.....	.....	.....
		w	39.2 40.7 40.8	40.23	.....	.....	.....	.....
		y	44.8 45.4 44.0	44.73	.....	.....	.....	.....
		n	30.2 27.8 29.4	29.13	.....	.....	.....	.....
		d	15.2 14.8 15.8	15.27	.....	.....	.....	.....
		p	27.5 27.2 27.7	27.47	.....	.....	.....	.....
		s	20.0 20.0 20.0	20.00	.....	.....	.....	.....
22 00								
1902 November 3.			WEDGE V.				Seeing fair to poor.	
		s	35.2 35.7 35.8	35.57	34.55	3.14	11.19	11.54
		p	40.0 40.0 40.0	40.00	39.75	3.75	11.80	12.15
		d	25.7 25.8 27.0	26.17	25.84	2.27	10.32	10.67
		n	38.0 40.5 41.8	40.77	39.65	3.74	11.79	12.14
		v	36.9 36.1 36.8	36.60	.....	3.38	11.43	11.78
		y	56.9 59.8 58.1	58.27	58.74	5.43	13.48	13.83
		w	53.0 53.7 54.5	53.73	55.42	5.25	13.30	13.65
		x	46.9 47.2 46.7	46.93	47.12	4.54	12.59	12.94
		x	46.1 48.1 47.7	47.30	.....	.....	.....	.....
		w	57.5 57.5 56.3	57.10	.....	.....	.....	.....
		y	58.6 58.7 60.3	59.20	.....	.....	.....	.....
		n	37.7 38.7 39.2	38.53	.....	.....	.....	.....
		d	24.1 25.5 26.9	25.50	.....	.....	.....	.....
		p	39.6 39.4 39.5	39.50	.....	.....	.....	.....
		s	34.0 33.3 33.3	33.53	.....	.....	.....	.....
1 20								

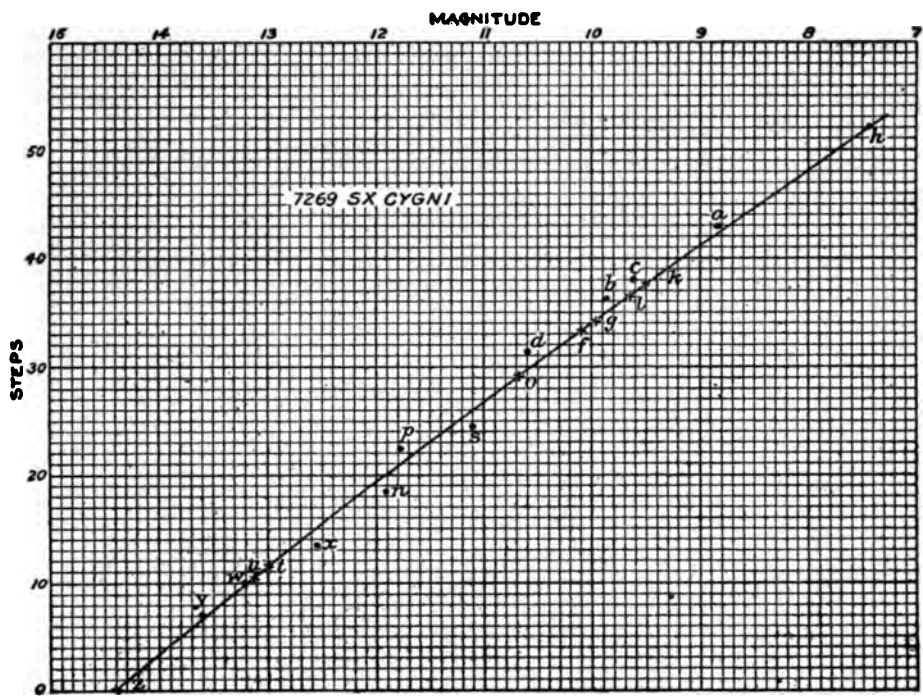


FIG. 28.—MAGNITUDE-CURVE FOR SX CYGNI.

TABLE 84.—7269 SX CYGNI. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

6-INCH.															
Star.	1904 September 5.					1904 October 1.					1904 October 2.				
	C.	Obs. Mag.		Δ Mag.		C.	Obs. Mag.		Δ Mag.		C.	Obs. Mag.		Δ Mag.	
		H.	P.	H.	P.		H.	P.	H.	P.		H.	P.		
E...	0.27	7.12	7.47	+ .09	+ .10	0.35	7.24	7.59	+ .21	+ .22	-0.08	7.06	7.41	+ .03	+ .04
F...	0.38	7.23	7.58	- .15	.00	0.25	7.14	7.49	- .24	-.09	0.06	7.20	7.55	- .18	-.03
G...	0.03	6.72	7.07	- .11	-.27	-0.03	6.86	7.21	+ .03	-.13	-0.17	6.97	7.32	+ .14	-.02
Means.	0.23	7.08	7.43	± .12	± .09	0.19	7.08	7.43	± .16	± .15	-0.06	7.08	7.43	± .12	± .03
M ₀....	....	6.85	7.20	...	...	....	6.89	7.24	...	...	....	7.14	7.49	...	...

12-INCH.					40-INCH.				
Star.	Mag. 6-inch.	C.			Star.	Mag. 12-inch.	C.		
		Oct. 28.	Nov. 1.	Nov. 3.			Oct. 24.	Nov. 3.	Oct. 17.
a.....	8.91	1.09	1.65	1.11	d.....	10.50	1.03	2.27	1.51
b.....	9.78	2.31	2.61	2.04	p.....	11.79	2.38	3.75	2.58
c.....	9.63	1.78	2.57	1.84	s.....	11.00	1.50	3.14	1.72
Mean C....	....	1.73	2.28	1.66	Mean C....	....	1.64	3.05	1.94
Mean Mag..	9.44	9.44	9.44	9.44	Mean Mag.	11.10	11.10	11.10	11.10
M ₀.....	....	7.71	7.16	7.78	M ₀.....	....	9.46	8.05	9.16

TABLE 86.—7269 SX CYGNI. VISUAL OBSERVATIONS OF THE VARIABLE.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
1	1899 Oct. 12	8	2410000+ 4940.58	80	6	{ v1b, v1c, v4d, a4-5v.... v1k, v2l, h8-10a, a4-5v. v1c, v2b, b3f, f2d, b2g... }	{ 37.2, 39.0, 35.3, 38.5 39.5, 38.5, 38.5 39.0, 38.2, }	38.2	9.41	moon	0	-0.22
2	17	6	4945.50	80	6	a6-7v, v1b, v1c, v2m....	36.5, 37.2, 39.0, 34.5	37.6	9.52	moon	5	-0.18
3	20	7	4948.52	80	6	co-1v, v1-2b....	37.0, 37.7....	37.4	9.53	good	8	-0.24
4	23	8	4951.56	150	6	v3-4d, vb....	34.8, 36.2....	35.5	9.80	good	11	0.00
5	28	7	4956.52	150	6	b1v, v3d, limit n....	35.3, 34.3....	34.8	9.90	good	16	+0.03
6	Nov. 3	8	4962.58	150	6	b2v, v3d....	34.2, 34.3....	34.2	9.98	fair	22	0.00
7	8	6	4967.50	150	6	b2v, v3d....	34.2, 34.3....	34.2	9.98	fair	27	-0.06
8	15	6	4974.50	150	6	b4v, v1d....	32.2, 32.3....	32.2	10.26	good	34	+0.10
9	20	6	4979.50	150	6	b4v, v0-1d....	32.2, 31.8....	32.0	10.28	fair	39	-0.04
10	25	6	4984.50	150	6	b5v, v0-1d....	31.2, 31.8....	31.5	10.35	fair	44	+0.02
11	Dec. 4	7	4993.54	150	6	b5v, v1d....	31.2, 32.3....	31.8	10.31	good	53	-0.20
12	19	6	5008.50	150	6	d1-2v....	29.8	29.8	10.60	fair	68	-0.22
13	27	6	5016.50	150	6	d4-5v, v10....	26.8, 30.1....	28.4	10.77	good	76	-0.26
14	1900 Jan. 2	6	5022.50	150	6	d5v, v0, v2-3p....	26.3, 29.1, 24.9....	26.8	11.00	good	82	-0.22
15	22	6	5042.50	150	6	v not seen, limit d....	<31.3	<10.4	<10.4	low	102	....
16	24	7	5044.52	200	6	p3v, v1n, limit n....	19.4, 19.4....	19.4	11.98	poor	104	-0.04
17	31	7	5051.52	200	6	v not seen, limit 4<0....	<25.1, <22....	<23	<11.5	low	....	....
18	Mar. 2	13	5081.79	275	12	n6v, limit v....	12.4....	12.4	12.89	good	141	-0.11
19	6	17	5085.96	150	6	v not seen, n not seen. {v is 1 to 1½M<n, v near {limit....	<18.4	<12.1	<12.1	fair	146	....
20	15	17	5094.95	350	40	v2w, v1f, f1u, x1v, x2w....	12.0, 12.5, 12.5....	12.3	12.90	good	155	-0.04
21	22	16	5101.92	350	40	w1v, f1-2v, v glimpsed....	9.0, 9.0....	9.0	13.31	good	162	-0.32
22	Apr. 4	16	5114.90	275	12	x4v, wv, v3y....	9.5, 10.0, 10.0....	9.8	13.23	poor	175	-0.07
23	6	16	5116.92	350	40	v suspected, f and y not held	<11.5	<13.0	<13.0	poor	177	-0.07
24	May 1	14	5141.85	275	12	x4v, v1w, v3y....	9.5, 11.0, 10.0....	10.2	13.17	fair	202	....
25	2	15	5142.88	350	40	x3-4v, v0-1w, v4-5y....	10.0, 10.5, 11.5....	10.7	13.11	fair	203	+0.03
26	11	14	5151.83	460	40	n6-8v, x1-2v, v2w, limit w....	11.4, 12.0, 12.0....	11.8	12.98	good	212	+0.06
27	28	14	5168.83	275	12	n4v, vx, v3w, w10s, limit x....	14.4, 13.5, 13.0....	13.6	12.75	good	229	+0.14
28	29	12	5169.75	237	40	n3v, v3x, v5d, v5w....	15.4, 16.5, 16.5, 15.0	15.9	12.47	good	230	-0.05
29	June 13	12	5184.75	460	40	n1-2v, limit 1<v....	16.9	16.9	12.31	good	245	-0.13
30	23	10	5194.67	200	6	s3v, vp, v3n....	21.6, 22.4, 21.4....	21.8	11.68	good	255	-0.12
31	July 16	9	5217.63	150	6	s2v, limit v....	22.6	22.6	11.57	good	277	-0.34
32	Aug. 6	9	5238.63	150	6	s3v, limit v....	21.6	21.6	11.7±	moon	298	+0.04
33	8	9	5240.63	150	6	v1s, v4-5p, v8n, d8v....	25.6, 26.9, 26.4, 23.3	25.8	11.13	moon	300	+0.23
34	13	9	5245.63	150	6	d1v, v3s....	30.3, 27.6....	29.0	10.70	good	305	-0.10
35	18	9	5250.63	150	6	b3v, v1-2d....	33.2, 33.8....	33.5	10.06	good	310	-0.37
36	28	9	5260.63	150	6	b2v, v6d....	34.2, 37.3....	35.2	9.85	good	320	-0.28
37	Sept. 4	8	5267.58	40	6	a5v, v1b, v1c....	38.0, 37.2, 39.0....	38.1	9.43	moon	327	+0.05
38	15	7	5278.54	150	6	photometer....	....	....	8.89	good	338	+0.11
39	21	9	5284.63	40	6	a5v, v3b....	38.0, 39.2....	38.6	9.37	....	....	....
40	Oct. 10	7	5303.54	150	6	a5v, vc, v1d....	38.0, 38.0, 37.2....	37.7	9.50	good	363	+0.30
41	26	7	5319.54	150	6	c2-3v, b2v, v4d....	35.5, 34.2, 35.3....	35.0	9.86	good	379	+0.29
42	Nov. 15	6	5339.50	150	6	b4-5v, vd, v6s....	31.7, 31.3, 30.6....	31.2	10.39	good	399	+0.36
43	29	6	5353.50	150	6	b4-5v, do-1v, v5-6s....	31.7, 30.8, 29.9....	30.8	10.45	good	4	+0.69
44	Dec. 11	6	5365.50	150	6	d6v, vs, v4p....	25.3, 24.6, 26.4....	25.2	11.20	good	16	+0.60
45	29	7	5383.50	150	6	....	....	....	....	fair	34	+0.95
46	1901 Oct. 31	8	5689.58	80	12	v1-2a....	44.5	43.8	8.66	....	340	-0.56
47	Dec. 21	13	5740.79	275	12	limit6<n,2<u,1<w,2<x	43.0	39.5	9.24	moon	391	-0.16
48	1902 Mar. 28	15	5837.88	237	40	d5-6v, v3n....	25.8, 21.4....	23.6	11.43	good	80	+0.23
49	July 10	9	5941.63	80	12	v not seen, limit 1<n....	<17.4	<12.3	<12.3	good	....	....
50	Oct. 7	10	6030.67	80	12	vn±	18.4	18.4	12.1±	good	272	0.00

TABLE 86.—7269 SX CYGNI. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
	1902		2410000+									
51	Oct. 24	8	6047.58	237	40	photometer.....	.....	.....	11.73	good	289	-0.07
52	Oct. 31	9	6054.63	237	40	s4v, p1-2v, v2n.....	20.6, 20.9, 20.4....	20.6	11.85	fair	296	+0.26
53	Nov. 3	10	6057.67	237	40	photometer.....	.....	.....	11.49	fair	300	+0.02
54	Dec. 30	8	6084.58	...	24	photograph.....	.....	.....	10.0±	.....	...	.....
55	Dec. 26	13	6110.79	237	40	v±.....	.....	43.±	8.75±	fair	353	-0.31
	1903											
56	Oct. 11	7	6399.54	150	6	v glimpsed, n3-4v.....	.....	15.±	12.6±	good	231	-0.19
57	Oct. 13	9	6401.63	80	12	v glimpsed, n4-5v.....	.....	14.±	12.7±	fair	233	-0.03
	1904											
58	July 31	11	6693.71	150	6	v not seen, limit u.....	.....	<10.5	<13.1	moon	...	.....
59	Aug. 3	9	6696.63	67	12	n5v, v1x.....	5.5, 14.5.....	10.±	13.2±	good	119	+0.68
60	Aug. 27	8	6720.58	150	6	v not seen, limit 1-2<n.....	.....	<17.	<12.3	moon	...	.....
61	Sept. 24	10	6748.67	...	24	{photographs, v not seen, limit 2<w.....}	.....	<10.	<13.2	moon	...	.....
62	Oct. 6	10	6760.67	237	40	vγ, v certainly fainter than w.....	.....	7±	13.6±	dull	183	-0.27
63	Nov. 28	...	6782.	67	12	v not seen, limit n.....	.....	<18	<12.2	good	...	.....
64	Nov. 30	12	6815.75	40	6	v not seen, limit n.....	.....	<18	<12.2	good	...	.....
	1905											
65	Jan. 3	7	6849.54	237	40	n6v, v3x, v6w.....	12.4, 16.5, 16.0....	15.0	12.57	fair	272	+0.47
66	Feb. 14	17	6891.96	250	40	d6v, v6n, v8, v3p.....	25.3, 24.4, 24.6, 25.4	24.9	11.27	good	315	+0.47
67	Mar. 24	17	6929.96	40	6	v6, v1b.....	38.0, 37.2.....	37.6	9.50	fair	...	.....
68	Apr. 4	16	6940.92	237	40	v±.....	.....	43.0	8.75	.....	...	.....
69	Apr. 30	15	6966.88	150	6	a3v±.....	.....	40.0	9.17	poor	389	-0.19
70	May 31	10	6997.67	150	6	b10-12v±, v0-1d.....	(25), 32.3.....	32.3	10.23	fair	11	+0.43
71	June 22	10	7019.67	150	6	d6v, s1v, v4p, v6n.....	25.3, 23.6, 26.4, 24.4	24.9	11.25	good	33	+1.11
72	June 26	11	7023.71	80	12	s2v, v2p, v4n.....	22.6, 24.4, 22.4....	23.1	11.50	good	37	+1.29
73	July 26	9	7053.63	150	6	v±, near limit.....	.....	22.4	11.57	fair	67	+0.70
74	Aug. 6	10	7064.67	237	40	d5v, v1n, p1v.....	26.3, 19.4, 21.4....	20.9	11.80	good	78	+0.66
75	Aug. 9	9	7067.63	150	6	n3v, p4v.....	15.4, 19.4.....	17.4	12.25	fair	81	+1.03
76	Aug. 28	9	7086.63	150	6	n2v, limit 3<n.....	.....	16.4	12.38	fair	100	+0.52
77	Sept. 23	7	7112.54	237	40	v8, v4w.....	13.5, 14.0.....	13.7	12.73	good	126	-0.02
78	Oct. 1	10	7120.67	237	40	x4v, v1w.....	9.5, 11.0.....	10.5	13.11	fair	134	+0.19
79	Oct. 20	7	7139.54	80	12	v not seen, limit 5<n.....	.....	<13.4	<12.8	.....	...	.....
80	Oct. 21	9	7140.63	237	40	x6v, w3-4v, v1-2y.....	7.5, 6.5, 8.5.....	7.5	13.57	good	154	+0.33
81	Nov. 18	6	7168.50	237	40	w2v, v2y.....	8.0, 9.0.....	8.5	13.37	good	182	+0.07

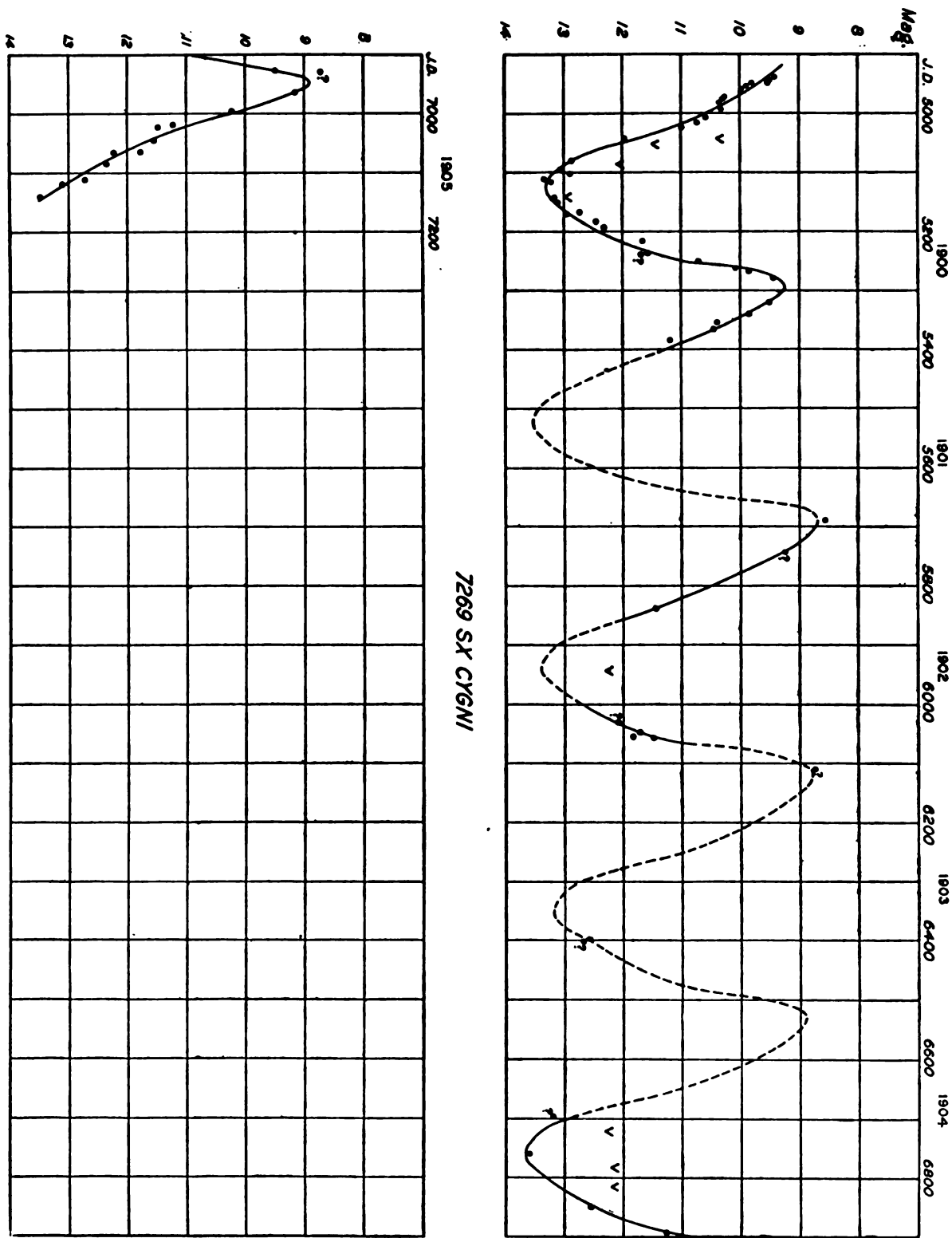


FIG. 29.—LIGHT-CURVE OF SX CYGNI.

TABLE 87.—7269 SX CYGNI. MEAN MAGNITUDES FROM 34.1 DAY GROUPS.

Group No....	1	2	3	4	5	6	7	8	9	10	11	12
J. D.....	34.1	68.2	102.3	136.4	170.5	212.6	238.7	272.8	306.9	341.0	375.1	409.2
4940 {	<i>t</i>	12	43	75	104	153	185	224	250	298	324	363
	<i>M</i>	9.73	10.30	10.79	11.98	12.96	13.24	12.95	12.39	11.52	10.04	9.37
	ΔM	-0.10	-0.03	-0.23	-0.04	-0.16	-0.04	+0.05	-0.12	-0.04	-0.12	+0.30
	No.	7	4	3	1	3	3	2	4	4	1	2
5349 {	<i>t</i>	10	34	...	...	...	...	...	...	340	...	391
	<i>M</i>	10.42	11.20	...	...	...	...	...	...	8.66	...	9.24
	ΔM	+0.64	+0.95	...	...	...	...	...	...	-0.56	...	-0.16
	No.	2	1	...	...	...	...	...	...	1	...	1
5758 {	<i>t</i>	...	...	80	...	...	...	...	295	...	353	...
	<i>M</i>	...	...	11.43	...	...	...	...	11.69	...	8.75	...
	ΔM	...	...	+0.23	...	...	...	...	+0.07	...	-0.31	...
	No.	...	...	1	...	...	...	...	3	...	1	...
6168 {	<i>t</i>	...	...	...	...	...	232	...	...	...	...	...
	<i>M</i>	...	...	...	...	...	12.65	...	...	...	...	...
	ΔM	...	...	...	...	...	-0.11	...	...	...	...	...
	No.	...	...	...	...	...	2	...	...	...	...	...
6577 {	<i>t</i>	...	...	...	119	...	183	...	272	...	315	...
	<i>M</i>	...	...	...	13.2±	...	13.6±	...	12.57	...	11.27	...
	ΔM	...	...	...	+0.68	...	+0.27	...	+0.47	...	+0.47	...
	No.	...	...	...	1	...	1	...	1	...	1	...
6986 {	<i>t</i>	...	...	...	...	...	...	...	...	...	...	...
	<i>M</i>	...	...	...	...	...	...	...	...	...	...	...
	ΔM	...	...	...	...	...	...	...	...	...	...	...
	No.	...	...	...	...	...	...	...	...	...	...	...
Means {	<i>t</i>	12	41	76	112	153	184	227	257	297	324	358
	<i>M</i>	9.88	10.48	10.95	12.59	12.96	13.33	12.83	12.45	11.59	10.01	9.06
	ΔM	-0.01	+0.16	-0.12	+0.32	-0.16	+0.04	-0.01	+0.08	+0.01	-0.09	0.00
	No.	9	5	4	2	3	4	5	3	7	6	2

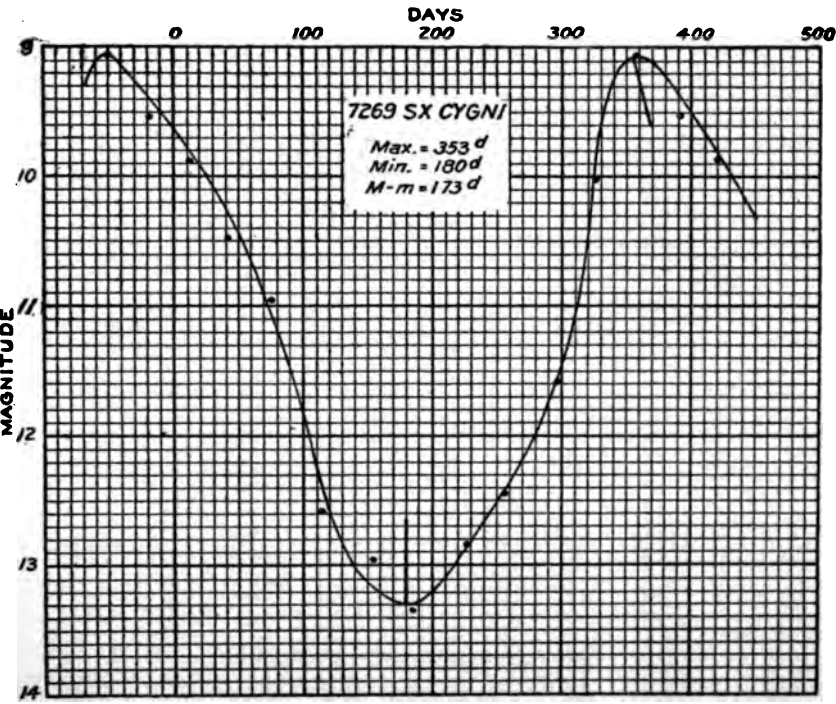


FIG. 30.—MEAN LIGHT-CURVE OF SX CYGNI.

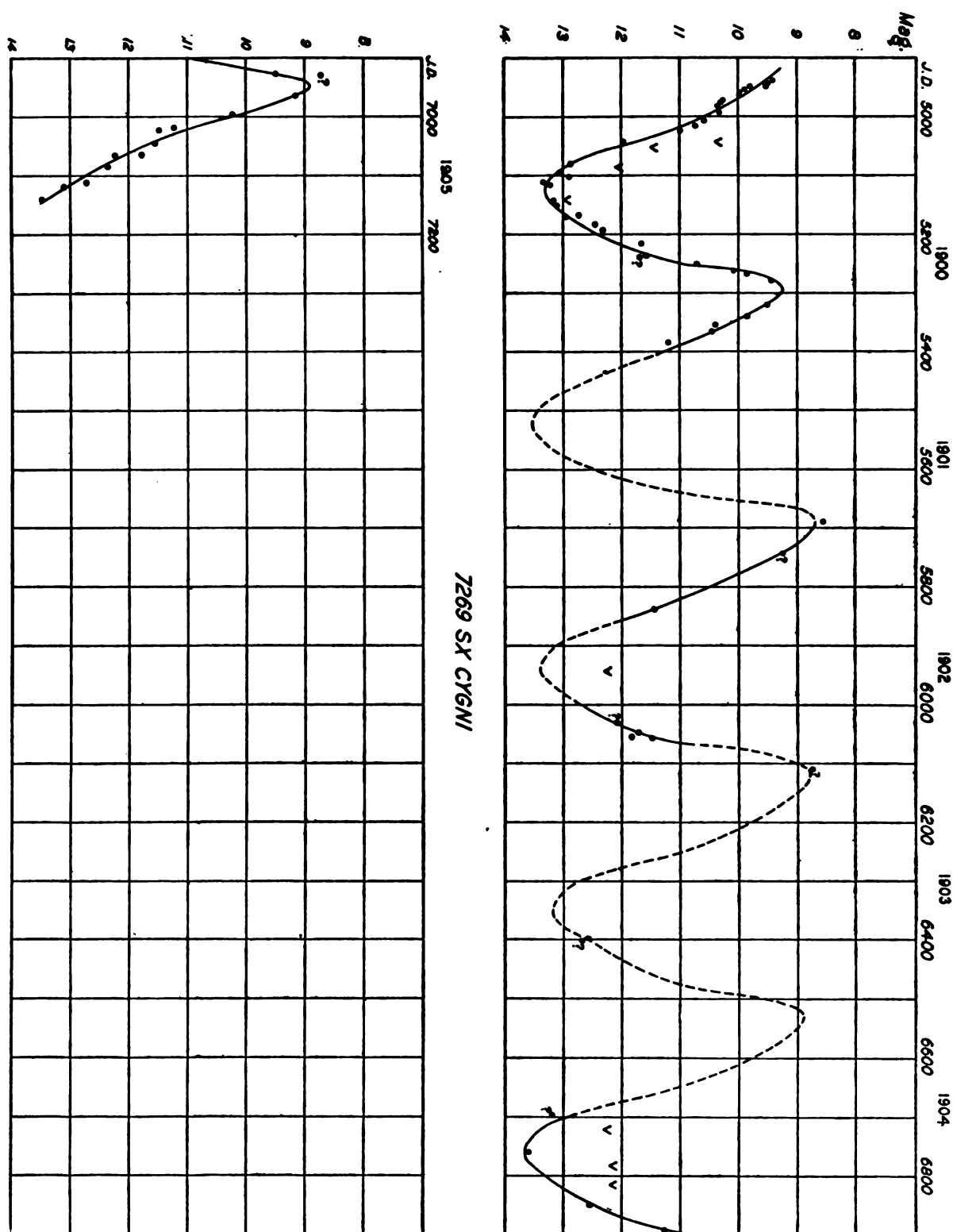


FIG. 29.—LIGHT-CURVE OF SX CYGNI.

TABLE 87.—7269 SX CYGNI. MEAN MAGNITUDES FROM 34.1 DAY GROUPS.

Group No....	1	2	3	4	5	6	7	8	9	10	11	12
J. D.....	34.1	68.2	102.3	136.4	170.5	212.6	238.7	272.8	306.9	341.0	375.1	409.2
4940 {	<i>t</i>	12	43	75	104	153	185	224	250	298	324	363
	<i>M</i>	9.73	10.30	10.79	11.98	12.96	13.24	12.95	12.39	11.52	10.04	9.37
	ΔM	-0.10	-0.03	-0.23	-0.04	-0.16	-0.04	+0.05	-0.12	-0.04	-0.12	+0.30
	No.	7	4	3	1	3	3	3	2	4	4	1
5349 {	<i>t</i>	10	34	...	...	...	...	...	...	...	340	...
	<i>M</i>	10.42	11.20	...	...	...	...	...	...	...	8.66	...
	ΔM	+0.64	+0.95	...	...	...	...	...	...	...	-0.56	...
	No.	2	1	...	...	...	...	...	...	...	1	...
5758 {	<i>t</i>	...	...	80	...	...	...	...	...	295	...	353
	<i>M</i>	...	...	11.43	...	...	...	...	...	11.69	...	8.75
	ΔM	...	...	+0.23	...	...	...	...	...	+0.07	...	-0.31
	No.	...	...	1	...	...	...	...	...	3	...	1
6168 {	<i>t</i>	...	...	...	...	...	232	...	...	...	...	...
	<i>M</i>	...	...	...	...	...	12.65	...	...	...	...	...
	ΔM	...	...	...	...	...	-0.11	...	...	...	...	...
	No.	...	...	...	...	...	2	...	...	...	...	...
6577 {	<i>t</i>	...	...	...	119	...	183	...	272	...	315	...
	<i>M</i>	...	...	...	13.2±	...	13.6±	...	12.57	...	11.27	...
	ΔM	...	...	...	+0.68	...	+0.27	...	+0.47	...	+0.47	...
	No.	...	...	...	1	...	1	...	1	...	1	...
6986 {	<i>t</i>	...	...	...	...	...	...	...	...	...	...	...
	<i>M</i>	...	...	...	...	...	...	...	...	...	...	...
	ΔM	...	...	...	...	...	...	...	...	...	...	...
	No.	...	...	...	...	...	...	...	...	...	...	...
Means {	<i>t</i>	12	41	76	112	153	184	227	257	297	324	358
	<i>M</i>	9.88	10.48	10.95	12.59	12.96	13.33	12.83	12.45	11.59	10.01	9.06
	ΔM	-0.01	+0.16	-0.12	+0.32	-0.16	+0.04	-0.01	+0.08	+0.01	-0.09	0.00
	No.	9	5	4	2	3	4	5	3	7	6	2

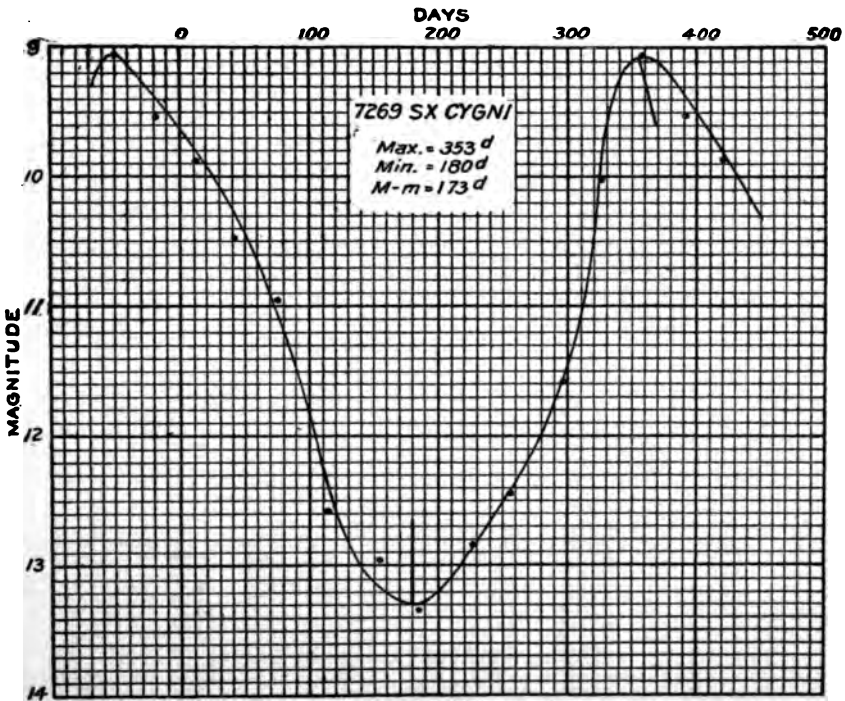


FIG. 30.—MEAN LIGHT-CURVE OF SX CYGNI.

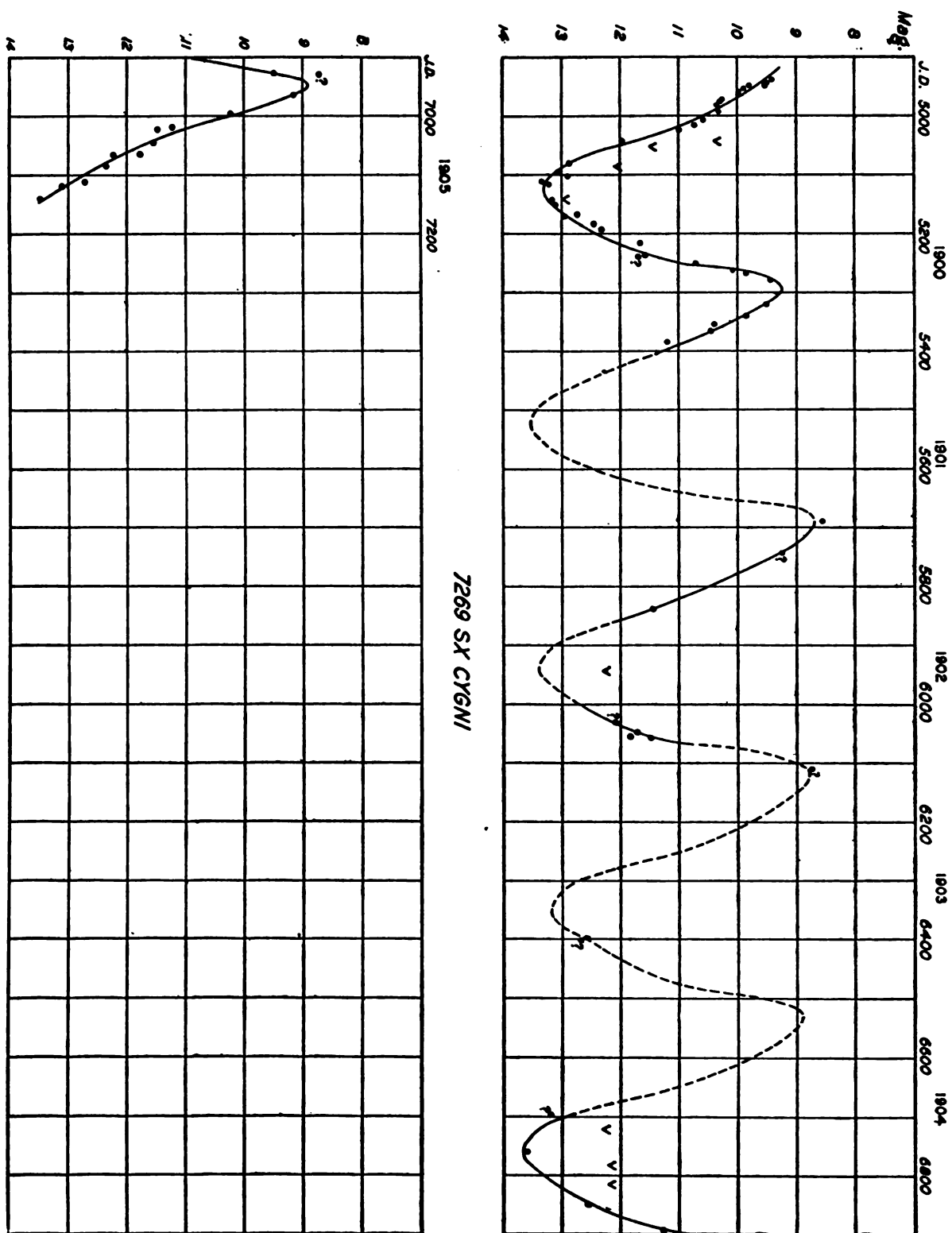


FIG. 29.—LIGHT-CURVE OF SX CYGNI.

TABLE 87.—7269 SX CYGNI. MEAN MAGNITUDES FROM 34.1 DAY GROUPS.

Group No....	1	2	3	4	5	6	7	8	9	10	11	12
J. D.....	34.1	68.2	102.3	136.4	170.5	212.6	238.7	272.8	306.9	341.0	375.1	409.2
4940 {	<i>t</i>	12	43	75	104	153	185	224	250	298	324	363
	<i>M</i>	9.73	10.30	10.79	11.98	12.96	13.24	12.95	12.39	11.52	10.04	9.37
	ΔM	-0.10	-0.03	-0.23	-0.04	-0.16	-0.04	+0.05	-0.12	-0.04	-0.12	+0.30
	No.	7	4	3	1	3	3	3	2	4	4	1
5349 {	<i>t</i>	10	34	....	....	....	....	....	....	....	340	....
	<i>M</i>	10.42	11.20	....	....	....	....	....	....	....	8.66	....
	ΔM	+0.64	+0.95	....	....	....	....	....	....	....	-0.56	....
	No.	2	1	....	....	....	....	....	....	....	1	....
5758 {	<i>t</i>	....	....	80	....	....	....	....	....	....	....	391
	<i>M</i>	....	....	11.43	....	....	....	....	....	....	....	9.24
	ΔM	....	....	+0.23	....	....	....	....	....	....	....	-0.16
	No.	....	....	1	....	....	....	....	....	....	....	1
6168 {	<i>t</i>	....	....	....	....	....	....	....	....	....	....	....
	<i>M</i>	....	....	....	....	....	....	....	....	....	....	....
	ΔM	....	....	....	....	....	....	....	....	....	....	....
	No.	....	....	....	....	....	....	....	....	....	....	....
6577 {	<i>t</i>	....	....	....	119	....	....	....	....	....	....	....
	<i>M</i>	....	....	....	13.2±	....	....	....	....	....	....	....
	ΔM	....	....	....	+0.68	....	....	....	....	....	....	....
	No.	....	....	....	1	....	....	....	....	....	....	....
6986 {	<i>t</i>	....	....	....	....	....	....	....	....	....	....	....
	<i>M</i>	....	....	....	....	....	....	....	....	....	....	....
	ΔM	....	....	....	....	....	....	....	....	....	....	....
	No.	....	....	....	....	....	....	....	....	....	....	....
Means {	<i>t</i>	12	41	76	112	153	184	227	257	297	324	358
	<i>M</i>	9.88	10.48	10.95	12.59	12.96	13.33	12.83	12.45	11.59	10.01	9.06
	ΔM	-0.01	+0.16	-0.12	+0.32	-0.16	+0.04	-0.01	+0.08	+0.01	-0.09	0.00
	No.	9	5	4	2	3	4	5	3	7	6	2

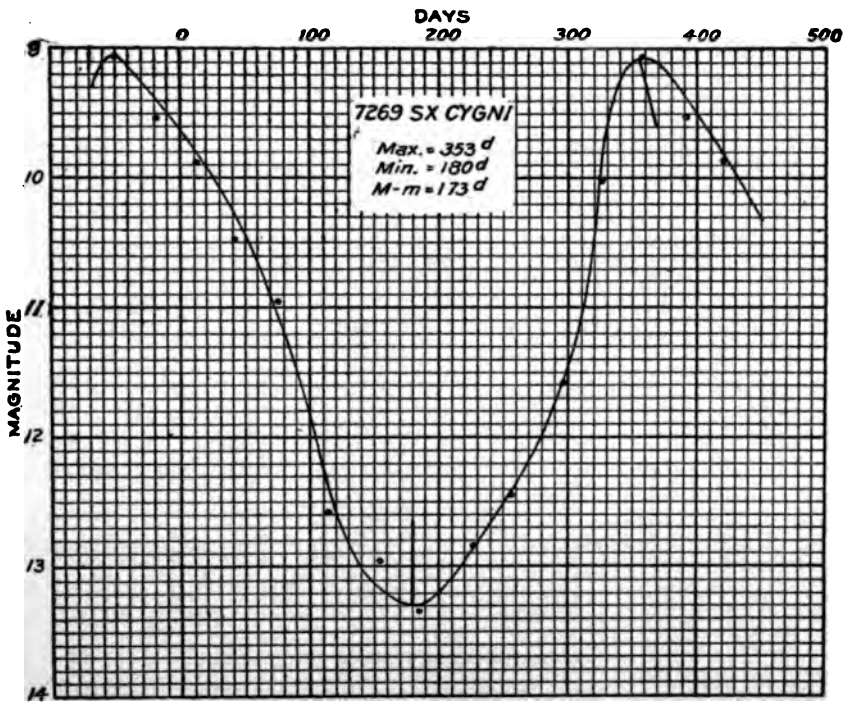


FIG. 30.—MEAN LIGHT-CURVE OF SX CYGNI.

THE CHART.

Plate 11 shows the field around the variable on a scale of 13."8 to the millimeter. It is a six-fold enlargement from a negative taken 1902 September 7, exposed from 9^h 17^m to 10^h 25^m, Central Standard Time, with the 24-inch reflector. The negative shows the star *A*, 16.3 magnitude, distinctly. The photographic magnitude of the variable on this plate is 10.4, which is 0.6 fainter than the visual brightness as given by the light-curve, fig. 32. This difference corresponds approximately to a color of 4 on Chandler's scale.

TABLE 89.—7458 V DELPHINI. STANDARD MAGNITUDE STARS.

Star.	B. D. No.	1900.		Color P.D.M.	Magnitude.				Residuals.		
		R. A.	Dec.		Catalogue.		Measured.		From Cats.		3 Nights inter se.
					H.C.O.	P.D.M.	H.	P.	H.	P.	
<i>F</i>	°	<i>h m s</i>	<i>° '</i>								
<i>G</i>	+19 4501	20 40 17	+20 07.9	GW	7.07	7.11	7.02	7.28	— 5	+17	±4
<i>K</i>	+19 4544	20 47 50	+19 45.4	GW	7.22	7.95	7.55	7.81	+33	—14	±2
	+19 4555	20 49 38	+19 22.7	WG	7.40	7.40	7.11	7.37	—29	— 3	±4
	Mean . . . . .	.....	.....		7.23	7.49	7.23	7.49	±22	±11	±3

THE COMPARISON STARS.

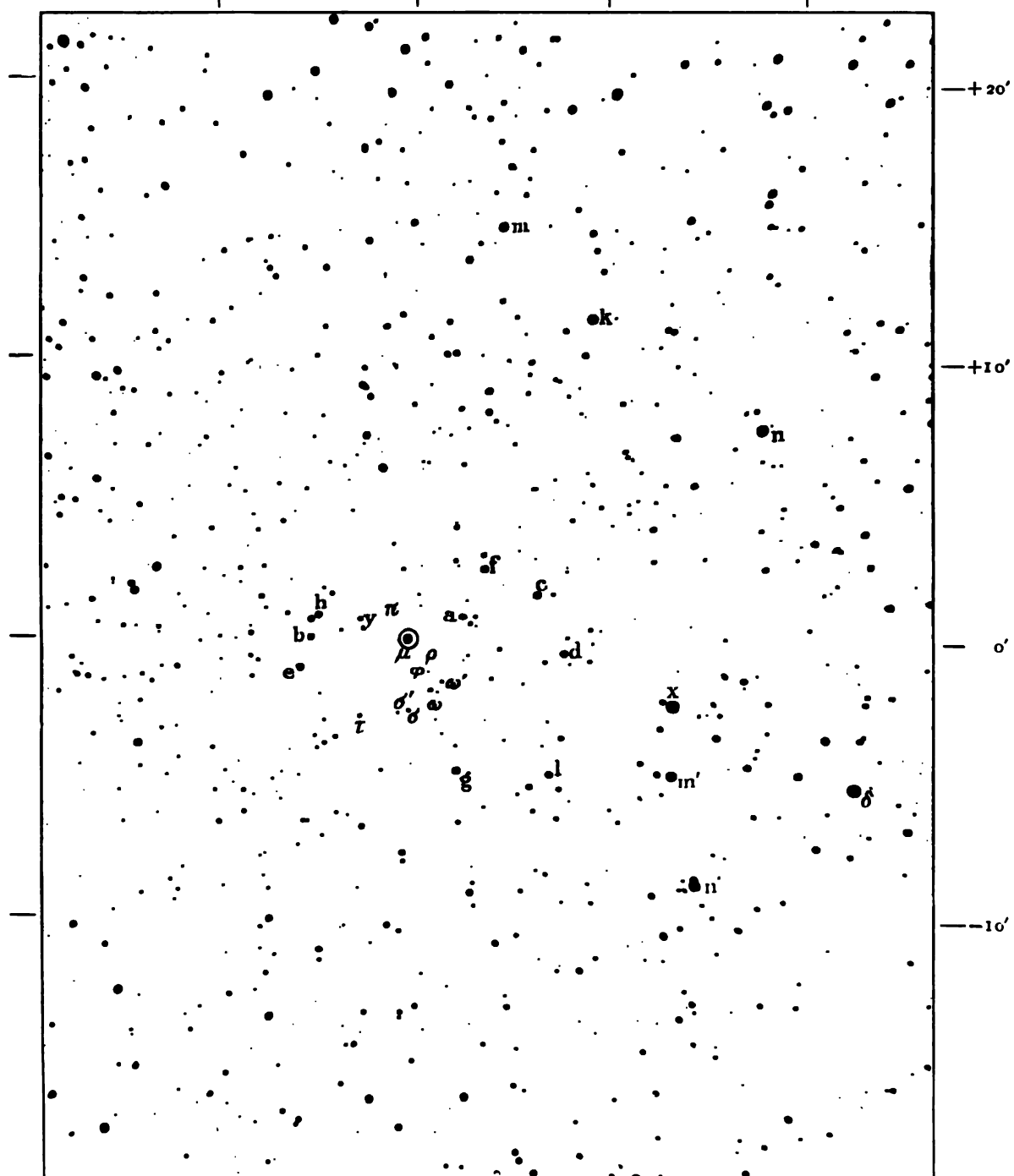
The data for the comparison stars are collected in Tables 89, 90, and 91, which are sufficiently explained by the headings of the columns. The difference between the mean magnitudes of the three fundamental stars in the Harvard and Potsdam catalogues, 0.26, is larger than usual, which seems to be due to the Harvard magnitude for the star *G* being 0.3 or 0.4 too small. The mean of three measures in October, 1883, is given as 6.91 in Harvard Annals, 24. The mean of three measures in September, 1894, is given as 7.52 in Volume 44 of the same Annals. Whether this difference is due to error in the first set of measures or to a change in the star itself remains unexplained.

TABLE 90.—7458 V DELPHINI. COMPARISON STARS IN B. D. CATALOGUE.

Star.	B. D.		1855.		Star.	B. D.		1855.	
	No.	Mag.	R. A.	Dec.		No.	Mag.	R. A.	Dec.
°			<i>h m s</i>	° '	°			<i>h m s</i>	° '
<i>ε</i>	+18 4602	8.2	20 37 56	+18 59.3	<i>n'</i>	+18 4617	9.2	20 40 26	+18 39.7
<i>ζ</i>	+19 4500	8.0	20 38 14	+19 11.1	<i>m'</i>	+18 4618	9.0	20 40 29	+18 43.2
<i>δ</i>	+18 4611	8.8	20 40 2	+18 43.9	<i>x</i>	+18 4619	8.9	20 40 31	+18 45.6
<i>η</i>	+18 4614	9.1	20 40 13	+18 55.5	<i>k</i>	+19 4513	9.4	20 40 43	+19 2.0

PLATE 11

- 1 III



1902 September 7.

7458 V DELHINI.
R. A. 20^h 43^m 13.6. Dec. +18° 58' 1", 1900.

TABLE 91.—COMPARISON STARS FOR V DELPHINI (IN ORDER OF RIGHT ASCENSION).

Star.	Coordinates from Variable.			Light Scale, Steps.	Magnitude.			
	R. A.		Dec.		Measured.		From Curve.	
					H.	P.	H.	P.
	"	s	"					
<i>δ</i>	—984	— 69.4	— 305	....	9.10	9.36	.....	.....
<i>n</i>	—768	— 54.1	+ 461	42.8	.....	.....	9.87	10.13
<i>n'</i>	—640	— 45.1	— 515	....	9.82	10.08	.....	.....
<i>m'</i>	—584	— 41.2	— 340	....	9.78	10.04	.....	.....
<i>x</i>	—575	— 40.5	— 135	46.4	9.29	9.55	.....	.....
<i>k</i>	—391	— 27.6	+ 696	40.2	.....	.....	10.28	10.54
<i>d</i>	—336	— 23.6	— 28	33.5	11.05	11.31	.....	.....
<i>l</i>	—313	— 22.0	— 289	36.6	11.63	11.89	.....	.....
<i>c</i>	—280	— 19.7	+ 96	30.9	11.31	11.57	.....	.....
<i>m</i>	—194	— 13.7	+ 890	40.9	.....	.....	10.17	10.43
<i>f</i>	—164	— 11.5	+ 149	34.5	11.04	11.30	.....	.....
<i>a</i>	—117	— 8.3	+ 48	27.6	12.13	12.39	.....	.....
<i>g</i>	—107	— 7.5	— 285	36.4	10.95	11.21	.....	.....
<i>ω'</i>	— 76	— 5.4	— 92	....	14.3	14.6	.....	.....
<i>ω</i>	— 56	— 3.7	— 107	....	13.73	13.99	.....	.....
<i>ρ</i>	— 45	— 3.2	— 71	4.5	14.7	15.0	.....	.....
<i>φ</i>	— 29	— 2.0	— 42	3.5	15.13	15.39	.....	.....
<i>A</i>	— 20	— 1.4	— 5	....	.....	.....	16.2±	16.5±
<i>σ</i>	— 4	— 0.3	— 152	14.	14.1	14.4	.....	.....
<i>μ</i>	+ 6	+ 0.4	— 12	2.	15.32	15.58	.....	.....
<i>σ'</i>	+ 17	+ 1.4	— 157	....	14.4	14.7	.....	.....
<i>π</i>	+ 48	+ 3.3	+ 39	4.	15.2	15.5	.....	.....
<i>τ</i>	+103	+ 7.2	— 164	16.	13.6	13.9	.....	.....
<i>y</i>	+104	+ 7.3	+ 41	20.	13.50	13.76	.....	.....
<i>h</i>	+190	+ 13.5	+ 45	30.8	.....	.....	11.63	11.89
<i>b</i>	+202	+ 14.3	— 8	28.8	.....	.....	11.94	12.20
<i>e</i>	+232	+ 16.4	— 64	33.2	.....	.....	11.30	11.56
<i>e'</i>	...	—195.	+ 660	55.2	.....	.....	7.81	8.1
<i>ε</i>	...	—178.	+ 1380	56.3	.....	.....	7.7	8.0

Table 92 gives the determination of the magnitude of the stars *m'*, *n'*, *x*, and *δ*, based on the fundamental stars *F*, *G*, and *K*. No correction has been made for change of atmospheric absorption depending on difference of zenith distance between the fundamental and measured stars, as it amounted to only 0.002 mag. Table 92 also gives the measures of *a*, *c*, *d*, *f*, *g*, and *l*, with the 12-inch and the fainter stars with the 40-inch.

In Table 94 the separate results are collected and the mean magnitudes found. The residuals for each night's measures are given in the column headed *d*, the mean values being—

With the 6-inch..... ±0.08
With the 12-inch..... ±0.05
With the 40-inch..... ±0.12

VISUAL COMPARISONS OF THE VARIABLE.

Table 95 gives in detail the visual comparisons of the variable by Argelander's method with the comparison stars thus determined. There are also included for comparison the photometric measures of the variable in observations Nos. 112 and 115, and estimates from the photograph, Nos. 114 and 123.

TABLE 92.—7458 V DELPHINI. PHOTOMETER MEASURES OF COMPARISON STARS.

1903 October 22.			6-INCH.				Good.	
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
<i>h m</i>	<i>°</i>							
21 6	25	<i>F</i>	12.9 12.8 12.8	12.83	12.62	0.59	6.96	7.22
	25	<i>G</i>	17.6 16.8 16.9	17.10	17.14	1.25	7.62	7.88
	25	<i>K</i>	13.5 13.6 13.7	13.60	13.62	0.74	7.11	7.37
	26	<i>x</i>	32.5 32.7 32.8	32.67	32.90	3.04	9.41	9.67
		<i>m'</i>	36.6 36.8 37.0	36.80	36.35	3.50	9.87	10.13
		<i>n'</i>	36.5 36.1 36.0	36.20	35.70	3.42	9.79	10.05
		<i>δ</i>	32.7 32.0 32.1	32.27	31.97	2.92	9.29	9.55
		<i>δ</i>	50.2 50.7 50.2	50.37	.....	4.73	11.10	11.36
		<i>δ</i>	31.9 32.1 31.0	31.67	.....	.....	.....	.....
		<i>n'</i>	35.2 35.4 35.0	35.20	.....	.....	.....	.....
		<i>m'</i>	36.1 36.2 35.4	35.90	.....	.....	.....	.....
		<i>x</i>	33.2 33.0 33.2	33.13	.....	.....	.....	.....
		<i>K</i>	13.4 13.9 13.6	13.63	.....	.....	.....	.....
	26	<i>G</i>	17.1 17.4 17.0	17.17	.....	.....	.....	.....
	26	<i>F</i>	12.5 12.3 12.4	12.40	.....	.....	.....	.....
21 32	26							
1903 October 23.								
							Good.	
21 4	26	<i>δ</i>	28.6 28.8 28.9	28.77	29.72	2.66	9.22	9.48
		<i>n'</i>	32.1 32.7 32.6	32.47	32.32	2.97	9.53	9.79
		<i>m'</i>	33.1 32.9 33.3	33.10	32.70	3.01	9.57	9.83
		<i>x</i>	31.3 31.4 31.5	31.40	30.34	2.72	9.28	9.54
		<i>K</i>	12.5 12.3 12.1	12.30	12.14	0.52	7.08	7.34
		<i>G</i>	15.9 15.3 15.7	15.63	15.45	0.99	7.55	7.81
		<i>F</i>	12.1 11.8 11.8	11.90	11.82	0.49	7.05	7.31
		<i>F</i>	10.7 11.1 10.4	10.73	.....	.....	.....	.....
		<i>G</i>	15.1 15.2 15.5	15.27	.....	.....	.....	.....
		<i>K</i>	11.5 12.1 12.3	11.97	.....	.....	.....	.....
		<i>x</i>	28.9 29.9 29.0	29.27	.....	.....	.....	.....
		<i>m'</i>	31.7 32.7 32.5	32.30	.....	.....	.....	.....
		<i>n'</i>	32.0 32.2 32.3	32.17	.....	.....	.....	.....
	27	<i>δ</i>	31.0 30.2 30.8	30.67	.....	.....	.....	.....
21 24	27							
1903 October 24.							Good, small moon.	
20 47	23	<i>F</i>	10.7 10.7 11.0	10.80	10.74	0.28	6.97	7.23
		<i>F_{at}</i>	15.7 16.0 16.6	16.10	16.67	1.17	7.86	8.12
	24	<i>G</i>	13.9 14.4 13.7	14.00	14.02	0.80	7.49	7.75
		<i>K</i>	11.6 12.1 11.7	11.80	11.59	0.46	7.15	7.41
		<i>x</i>	30.5 30.7 30.1	30.43	30.67	2.76	9.45	9.71
		<i>m'</i>	31.6 31.7 32.1	31.80	32.00	2.94	9.63	9.89
		<i>n'</i>	32.2 32.0 32.0	32.07	31.89	2.91	9.60	9.86
		<i>δ</i>	30.2 29.2 29.7	29.70	29.99	2.68	9.37	9.63
	25	<i>δ</i>	30.6 30.1 30.1	30.27	.....	.....	.....	.....
		<i>n'</i>	32.1 31.7 31.3	31.70	.....	.....	.....	.....
		<i>m'</i>	32.2 32.0 32.4	32.20	.....	.....	.....	.....
		<i>x</i>	30.5 31.0 31.2	30.90	.....	.....	.....	.....
		<i>K</i>	11.3 11.5 11.3	11.37	.....	.....	.....	.....
		<i>G</i>	14.4 14.3 13.4	14.03	.....	.....	.....	.....
		<i>F</i>	10.6 10.7 10.7	10.67	.....	.....	.....	.....
21 8	24	<i>F_{at}</i>	17.2 17.4 17.1	17.23	.....	.....	.....	.....

TABLE 92.—7458 V DELPHINI. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1903 October 25.			12-INCH.				Fair to good.		
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.		
				Mean of 3.	Mean of 6.		H.	P.	
<i>h m</i>	<i>°</i>								
23 15	40	<i>x</i>	21.0 21.8 21.3	21.37	21.89	1.91	9.32	9.58	
		<i>m'</i>	24.9 25.8 25.2	25.30	26.52	2.33	9.74	10.00	
		<i>n'</i>	27.4 28.2 27.9	27.83	27.40	2.40	9.81	10.07	
		<i>δ</i>	19.8 20.1 20.3	20.87	20.00	1.71	9.12	9.38	
		<i>l</i>	43.3 44.0 44.5	43.93	.....	4.20	11.61	11.87	
		<i>g</i>	38.0 37.7 38.1	37.93	37.97	3.54	10.95	11.21	
		<i>a</i>	49.9 50.2 49.0	49.70	49.69	4.77	12.18	12.44	
		<i>j</i>	38.8 37.9 38.0	38.23	38.68	3.62	11.03	11.29	
		<i>c</i>	40.0 39.3 39.2	39.50	.....	3.72	11.13	11.39	
		<i>d</i>	38.7 37.7 38.2	38.20	.....	3.57	10.98	11.24	
		<i>f</i>	39.4 39.0 39.0	39.13	.....	.....	.....	.....
		<i>a</i>	49.1 50.0 49.9	49.67	.....	.....	.....	.....
		<i>g</i>	38.2 38.0 37.8	38.00	.....	.....	.....	.....
		<i>δ</i>	20.1 19.7 20.0	19.93	.....	.....	.....	.....
		<i>n'</i>	26.9 27.0 27.0	26.97	.....	.....	.....	.....
		<i>m'</i>	28.2 27.7 27.3	27.73	.....	.....	.....	.....
		<i>x</i>	21.9 23.0 22.3	22.40	.....	.....	.....	.....
23 45	45								
1903 October 26.			Good, moon.						
21 3	24	<i>δ</i>	18.2 18.7 19.0	18.63	18.48	1.50	9.12	9.38	
		<i>n'</i>	24.6 25.3 24.9	24.93	24.30	2.15	9.77	10.03	
		<i>m'</i>	25.0 26.0 25.4	25.47	25.00	2.20	9.82	10.08	
		<i>x</i>	20.1 19.9 20.1	20.03	19.85	1.68	9.30	9.56	
		<i>d</i>	38.3 38.3 38.8	38.47	37.49	3.48	11.10	11.36	
		<i>c</i>	40.8 40.7 40.9	40.80	40.29	3.80	11.42	11.68	
		<i>j</i>	37.2 37.0 37.2	37.13	36.82	3.40	11.02	11.28	
		<i>a</i>	46.7 48.0 47.1	47.27	47.27	4.55	12.17	12.43	
		<i>g</i>	36.7 37.6 37.0	37.10	36.75	3.40	11.02	11.28	
		<i>l</i>	41.1 42.0 41.0	41.37	41.62	3.96	11.58	11.84	
		<i>l</i>	41.6 41.9 42.1	41.87	.....	.....	.....	.....
		<i>g</i>	37.4 35.4 36.4	36.40	.....	.....	.....	.....
		<i>a</i>	46.7 47.8 47.3	47.27	.....	.....	.....	.....
		<i>f</i>	36.9 36.0 36.6	36.50	.....	.....	.....	.....
		<i>c</i>	40.2 40.0 39.1	39.77	.....	.....	.....	.....
		<i>d</i>	36.8 36.3 36.4	36.50	.....	.....	.....	.....
		<i>x</i>	19.8 19.3 19.9	19.67	.....	.....	.....	.....
		<i>m'</i>	24.7 24.2 24.7	24.53	.....	.....	.....	.....
		<i>n'</i>	23.7 23.6 23.7	23.67	.....	.....	.....	.....
21 31	26	<i>δ</i>	18.2 18.3 18.5	18.33	.....	.....	.....	.....
1903 November 10.			Good.						
21 38	26	<i>δ</i>	11.2 12.1 12.2	11.83	12.43	0.71	9.05	9.31	
		<i>n'</i>	18.0 18.7 18.8	18.50	18.70	1.55	9.89	10.15	
		<i>m'</i>	16.7 17.7 17.2	17.20	17.99	1.45	9.79	10.05	
		<i>x</i>	14.3 13.1 13.8	13.73	14.00	0.91	9.25	9.51	
		<i>d</i>	30.8 30.9 31.8	31.17	30.84	2.74	11.08	11.34	
		<i>c</i>	33.8 34.0 33.3	33.70	33.74	3.05	11.39	11.65	
		<i>j</i>	30.8 30.0 30.1	30.30	30.67	2.72	11.06	11.32	
		<i>a</i>	41.1 40.0 40.4	40.50	39.27	3.70	12.04	12.30	
		<i>g</i>	28.5 29.0 28.2	28.57	28.79	2.53	10.87	11.13	
		<i>l</i>	36.0 37.0 36.2	36.40	.....	3.35	11.69	11.95	
		<i>g</i>	28.9 29.2 28.9	29.00	.....	.....	.....	.....
		<i>a</i>	38.1 38.0 38.0	38.03	.....	.....	.....	.....
		<i>f</i>	31.0 30.9 31.2	31.03	.....	.....	.....	.....
		<i>c</i>	33.2 33.9 34.2	33.77	.....	.....	.....	.....
		<i>d</i>	30.0 30.8 30.7	30.50	.....	.....	.....	.....
		<i>x</i>	14.2 14.3 14.3	14.27	.....	.....	.....	.....
		<i>m'</i>	18.7 19.0 18.6	18.77	.....	.....	.....	.....
		<i>n'</i>	19.0 18.6 19.1	18.90	.....	.....	.....	.....
		<i>δ</i>	12.2 13.8 13.1	13.03	.....	.....	.....	.....
22 2	29								

TABLE 92.—7458 V DELPHINI. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1900 July 26.			40-INCH, WEDGE II.				Twilight.	
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
<i>h m</i>	<i>°</i>							
		<i>d</i>	18.5 18.3 18.3 18.8	18.48	16.48	0.92	10.84	11.10
		<i>c</i>	23.2 22.2 23.2 22.2	22.70	21.72	1.77	11.69	11.95
		<i>f</i>	18.2 19.8 16.8 16.7	18.13	16.39	0.91	10.83	11.09
		<i>a</i>	27.8 25.1 25.5 26.9	26.33	24.93	2.23	12.15	12.41
		<i>y</i>	36.0 37.5 35.5 36.2	36.30	.....	3.52	13.44	13.70
		<i>l</i>	20.1 19.9	20.00	.....	1.5	11.4	11.7
		<i>g</i>	14.5 16.2	15.35	.....	0.72	10.6	10.9
		<i>a</i>	22.5 23.9 22.8 24.9	23.53	.....	.....	.....	.....
		<i>f</i>	13.2 14.8 14.9 15.7	14.65	.....	.....	.....	.....
		<i>c</i>	19.8 20.9 19.9 18.3	19.73	.....	.....	.....	.....
		<i>d</i>	14.2 15.0 13.9 14.8	14.48	.....	.....	.....	.....
1900 August 30.								
19 50		<i>f</i>	16.5 16.5 17.2	16.73	15.03	0.71	10.87	11.13
		<i>a</i>	27.0 27.2 24.9	26.37	24.17	2.13	12.29	12.55
		<i>y</i>	31.8 32.1 33.3	32.40	33.29	3.22	13.38	13.64
		<i>π</i>	52.0 50.0 50.9	50.97	50.89	5.03	15.19	15.45
		<i>μ</i>	49.9 54.7 53.6	52.73	52.08	5.13	15.29	15.55
		<i>ρ</i>	51.1 52.3 51.9	51.77	51.79	5.11	15.27	15.53
		<i>φ</i>	46.8	46.8	.....	4.7±	14.9±	15.1±
		<i>ω</i>	36.1 38.5 36.8	37.13	.....	3.62	13.78	14.04
		<i>ρ</i>	53.0 50.2 52.2	51.80	.....	.....	.....	.....
		<i>μ</i>	50.3 50.9 53.1	51.43	.....	.....	.....	.....
		<i>π</i>	50.9 49.8 51.7	50.80	.....	.....	.....	.....
		<i>γ</i>	33.3 35.2 34.0	34.17	.....	.....	.....	.....
		<i>a</i>	23.2 20.9 21.8	21.97	.....	.....	.....	.....
20 20		<i>f</i>	12.4 15.0 12.6	13.33	.....	.....	.....	.....
1900 September 6.								
Moon too bright.								
21 47		<i>d</i>	15.2 16.2 15.6	15.67	.....	0.80	10.95	11.21
		<i>c</i>	18.9 19.9 20.1	19.63	.....	1.43	11.58	11.84
		<i>f</i>	16.0 12.0 14.4	14.13	.....	0.58	10.73	10.99
		<i>a</i>	22.0 24.2 25.7	23.97	.....	2.10	12.25	12.51
		<i>γ</i>	37.9 34.3 35.0	35.73	.....	3.46	13.61	13.87
22 5		<i>ω</i>	38.9 39.6 37.7	38.73	.....	3.79	13.94	14.20
1900 September 13.								
Good.								
22 22		<i>d</i>	16.5 15.1 15.9	15.83	15.70	0.80	11.04	11.30
		<i>c</i>	19.2 18.2 17.8	18.40	18.09	1.21	11.45	11.71
		<i>f</i>	12.0 11.8 12.3	12.03	12.88	0.40	10.64	10.90
		<i>a</i>	25.0 25.9 23.4	24.77	24.39	2.16	12.40	12.66
		<i>y</i>	35.2 35.7 32.5	34.47	34.32	3.32	13.56	13.82
		<i>μ</i>	52.1 52.0 51.9	52.00	.....	5.12	15.36	15.62
		<i>ρ</i>	47.5 46.9 47.8	47.40	.....	4.75	14.99	15.25
		<i>φ</i>	43.0 ..... ..	.....	.....	4.3±	14.5±	14.8±
		<i>ω'</i>	41.0 ..... ..	.....	.....	4.1±	14.3±	14.6±
		<i>ω</i>	30.5 ..... ..	.....	.....	2.9±	13.1±	13.4±
		<i>σ</i>	39.8 ..... ..	.....	.....	3.9±	14.1±	14.4±
		<i>σ'</i>	42.7 ..... ..	.....	.....	4.2±	14.4±	14.7±
		<i>τ</i>	37.7 ..... ..	.....	.....	3.7±	13.9±	14.2±
		<i>γ</i>	34.8 33.9 33.8	34.17	.....	.....	.....	.....
		<i>a</i>	23.8 24.2 24.0	24.00	.....	.....	.....	.....
		<i>l</i>	11.0 11.9 11.1	11.33	.....	.....	.....	.....
		<i>f</i>	13.2 14.5 13.5	13.73	.....	.....	.....	.....
		<i>c</i>	17.1 19.0 17.2	17.77	.....	.....	.....	.....
22 57		<i>d</i>	14.9 16.6 15.2	15.57	.....	.....	.....	.....

TABLE 93.—7458 DELPHINI. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

6-INCH.															
Star.	1903 October 22.					1903 October 23.					1903 October 24.				
	C.	Obs. Mag.		J Mag.		C.	Obs. Mag.		J Mag.		C.	Obs. Mag.		J Mag.	
		H.	P.	H.	P.		H.	P.	H.	P.		H.	P.	H.	P.
F.....	0.59	6.96	7.22	-.11	+.11	0.49	7.05	7.31	-.02	+.20	0.36	6.97	7.23	-.10	+.12
G.....	1.25	7.62	7.88	+.41	-.06	0.99	7.55	7.81	+.33	-.14	0.80	7.49	7.75	+.27	-.20
K.....	0.74	7.11	7.37	-.29	-.03	0.52	7.08	7.34	-.32	-.06	0.46	7.15	7.41	-.25	-.01
Means..	0.86	7.23	7.49	±.27	±.07	0.67	7.23	7.49	±.22	±.13	0.54	7.23	7.49	±.21	±.11
M ₀....	....	6.37	6.63	.....	.....	....	6.56	6.82	.....	.....	....	6.69	6.95	.....	.....

12-INCH.					40-INCH.					
Star.	Mag. 6-inch.	C.			Star.	Mag. 12-inch.	C.			
		Oct. 25.	Oct. 26.	Nov. 10.			July 26.	Aug. 30.	Sept. 6.	Sept. 13
m'.....	9.69	2.33	2.20	1.45	a.....	12.13	2.23	2.13	2.10	2.16
n'.....	9.64	2.40	2.15	1.55	c.....	11.31	1.77	....	1.43	1.21
x.....	9.38	1.91	1.68	0.91	d.....	11.05	0.92	....	0.80	0.80
δ.....	9.29	1.71	1.50	0.71	f.....	11.04	0.91	0.71	0.58	0.40
Mean C...	....	2.09	1.88	1.16	Mean C...	....	1.46	1.42	1.23	1.14
Mean Mag.	9.50	9.50	9.50	9.50	Mean Mag.	11.84	11.38	11.58	11.38	11.38
M ₀.....	....	7.41	7.62	8.34	M ₀.....	....	9.92	10.16	10.15	10.24

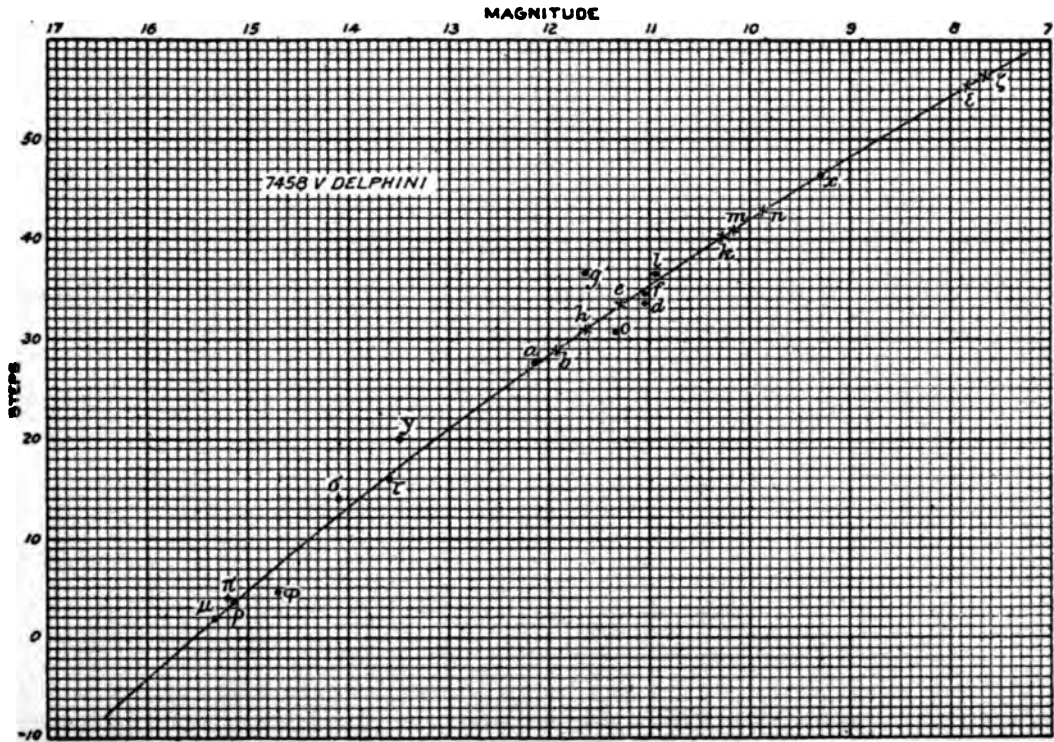


FIG. 31.—MAGNITUDE-CURVE FOR V DELPHINI.

TABLE 94.—7458 V DELPHINI. MEAN MAGNITUDES OF COMPARISON STARS.

6-INCH.											
Star.	October 22.		October 23.		October 24.		Mag.	Δ Mag.	Mean.		
	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.			Mag. H.	Mag. P.	Δ Mag.
F.....	6.96	−0.06	7.05	+0.03	7.04	+0.02	.....	.....	7.02	7.28	±0.04
G.....	7.62	+0.07	7.55	0.00	7.49	+0.06	.....	.....	7.55	7.81	±0.04
K.....	7.11	0.00	7.08	−0.03	7.15	+0.04	.....	.....	7.11	7.37	±0.02
Mean.....	.....	.....	.....	.....	.....	.....	.....	.....	7.23	7.49	±0.03
m'.....	9.87	+0.18	9.57	−0.12	9.63	−0.06	.....	.....	9.69	9.95	±0.12
n'.....	9.79	+0.15	9.53	−0.11	9.60	−0.04	.....	.....	9.64	9.90	±0.10
x.....	9.41	+0.03	9.28	−0.10	9.45	+0.07	.....	.....	9.38	9.64	±0.07
δ.....	9.29	0.00	9.22	−0.07	9.37	+0.08	.....	.....	9.29	9.55	±0.05
Mean.....	.....	.....	.....	.....	.....	.....	.....	.....	9.50	9.76	±0.07
12-INCH.											
Star.	October 25.		October 26.		November 10.		Mag.	Δ Mag.	Mean.		
	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.			Mag. H.	Mag. P.	Δ Mag.
m'.....	9.74	−0.04	9.82	+0.04	9.79	+0.01	.....	.....	9.78	10.04	±0.03
n'.....	9.81	−0.01	9.77	−0.05	9.89	+0.07	.....	.....	9.82	10.08	±0.04
x.....	9.32	+0.03	9.30	+0.01	9.25	−0.04	.....	.....	9.29	9.55	±0.03
δ.....	9.12	+0.02	9.12	+0.02	9.05	−0.05	.....	.....	9.10	9.36	±0.03
Mean.....	.....	.....	.....	.....	.....	.....	.....	.....	9.50	9.76	±0.03
a.....	12.18	+0.05	12.17	+0.04	12.04	−0.09	.....	.....	12.13	12.39	±0.06
c.....	11.13	−0.18	11.42	+0.11	11.39	+0.08	.....	.....	11.31	11.57	±0.12
d.....	10.98	−0.07	11.10	+0.05	11.08	+0.03	.....	.....	11.05	11.34	±0.05
f.....	11.03	−0.01	11.02	−0.02	11.06	+0.02	.....	.....	11.04	11.32	±0.02
g.....	10.95	0.00	11.02	+0.07	10.87	−0.08	.....	.....	10.95	11.13	±0.05
l.....	11.61	−0.02	11.58	−0.05	11.69	+0.06	.....	.....	11.63	11.95	±0.04
Mean.....	.....	.....	.....	.....	.....	.....	.....	.....	11.35	11.61	±0.06
40-INCH.											
Star.	July 26.		August 30.		September 6.		September 13.		Mean.		
	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag. H.	Mag. P.	Δ Mag.
a.....	12.15	−0.12	12.29	+0.02	12.25	−0.02	12.40	+0.13	12.37	12.53	±0.07
c.....	11.69	+0.12	.....	.....	11.58	+0.01	11.45	+0.12	11.57	11.83	±0.08
d.....	10.84	−0.10	.....	.....	10.95	+0.01	11.04	+0.10	10.94	11.20	±0.07
f.....	10.83	+0.06	10.87	+0.10	10.73	−0.04	10.64	−0.13	10.77	11.03	±0.08
Mean.....	.....	.....	.....	.....	.....	.....	.....	.....	11.38	11.64	±0.08
γ.....	13.44	−0.06	13.38	−0.12	13.61	+0.11	13.56	+0.06	13.50	13.76	±0.09
φ.....	.....	.....	14.9±	.....	.....	.....	14.5±	.....	14.7±	15.0±	.....
μ.....	.....	.....	15.29	−0.03	.....	.....	15.36	+0.04	15.32	15.58	±0.04
π.....	.....	.....	15.19	.....	.....	.....	.....	.....	15.2±	15.5±	.....
ρ.....	.....	.....	15.27	+0.14	.....	.....	14.99	−0.14	15.13	15.39	±0.14
ω.....	.....	.....	13.78	+0.05	13.94	+0.21	13.1±	.....	13.73	13.99	.....
ω'.....	.....	.....	.....	.....	.....	.....	14.3±	.....	14.3±	14.6±	.....
σ.....	.....	.....	.....	.....	.....	.....	14.1±	.....	14.1±	14.4±	.....
σ'.....	.....	.....	.....	.....	.....	.....	14.4±	.....	14.4±	14.7±	.....

TABLE 95.—7458 V DELPHINI. VISUAL OBSERVATIONS OF THE VARIABLE.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
1	1894 June 28	10	2410000+ 3008.67	150	6	{g1f, f2e, ec, e2d, d3b..... {c2a, h2b, e3h, limit 1 < a.....		.....	< 12	.....	.....	.....
2	30	10	3010.67	150	6	e3h, h2b, g2e, g3f, e1f, ab.....		.....	< 12	.....	.....	.....
3	July 6	10	3016.67	150	6	f2c, c1d, d3e, e4-5a, ab.....		.....	< 12	.....	.....	.....
4	23	10	3033.67	150	6	c1-2a, g2f, g3d.....		.....	< 12	.....	.....	.....
5	Aug. 6	10	3047.67	150	6	nothing visible in place of v.....		.....	.....	.....	.....	.....
6	Nov. 20	6	3153.50	150	6	f1d, d2c, c3a, b1a, limit a.....		.....	< 12	.....	.....	.....
7	Dec. 2	6	3165.50	150	6	c2a, a0-1b.....		.....	< 12	.....	.....	.....
8	13	6	3176.50	150	6	{b2a, f2d, d3c, c2b..... {b1-2a, limit a.....		.....	< 12	.....	.....	.....
9	19	6	3182.50	150	6	f1d, d3-4c, c4a, b2a.....		.....	< 12	.....	.....	.....
10	25	6	3188.50	150	6	c2-3a, b1a.....		.....	< 12	.....	.....	.....
11	1895 Jan. 15	6	3209.50	150	6	c2-3a, limit a.....		.....	< 12	.....	.....	.....
12	Feb. 21	..	3246.	150	6	a3d, a4c.....		.....	< 12	.....	.....	.....
13	May 26	10	3340.67	150	6	{a is not the var. v is in line..... {cae, v3f, k4v.....	39.6, 36.2.....	37.9	10.61	good	6	+0.82
14	June 13	10	3358.67	150	6	v1, v1-2f, v2-3d.....	36.6, 36.0, 36.0.....	36.2	10.92	good	24	+1.26
15	26	10	3371.67	150	6	f2v, v2c.....	32.5, 32.9.....	32.7	11.40	good	37	+1.50
16	July 9	9	3384.63	150	6	l5v, f3v, v4a.....	31.6, 31.5, 31.6.....	31.5	11.57	fair	50	+1.37
17	19	9	3394.63	150	6	f3v, v3a.....	31.5, 30.6.....	31.0	11.63	fair	60	+1.23
18	24	9	3399.63	150	6	d2v, v1c, f5v, v3a.....	31.5, 31.9, 29.5, 30.6.....	30.9	11.66	fair	65	+1.14
19	30	9	3405.63	150	6	c4v, v1-2a.....	26.9, 29.1.....	28.0	12.03	moon	71	+1.23
20	Aug. 12	9	3418.60	150	6	e7-8v, va.....	27.6, 26.7.....	27.1	12.15	good	84	+1.17
21	25	8	3431.58	150	6	a2v, limit v.....		25.6	12.35	fair	97	+1.08
22	26	9	3432.63	150	6	a2v, limit v.....		25.6	12.35	good	98	+1.04
23	Sept. 6	8	3443.58	150	6	v not seen, limit c.....		.....	< 11.4	fair	.....	.....
24	10	8	3447.58	40	6	v not seen, limit 2 < a.....		.....	< 12	good	.....	.....
25	1896 Aug. 10	9	3782.63	150	6	v not seen, limit a.....		.....	< 12	fair	.....	.....
26	26	8	3798.58	150	6	v not seen, limit 2 < a.....		.....	< 12	good	.....	.....
27	Sept. 23	..	3826.	80	6	v not seen, limit a.....		.....	< 12	fair	.....	.....
28	Oct. 5	8	3838.58	150	6	a2v, limit v.....		25.6	12.36	good	504	+1.20
29	24	6	3857.50	80	6	vk, v1m, x3v.....	40.2, 41.9, 43.4.....	41.8	10.09	fine	523	-0.10
30	26	8	3859.58	80	6	x3v, v2k.....	43.4, 42.2.....	42.8	9.95	fine	525	-0.15
31	Nov. 1	8	3865.58	150	6	x1-2v, v2k.....	44.9, 42.2.....	43.5	9.83	good	2	-0.07
32	12	7	3876.54	150	6	x1v, v6m, v5-6k.....	44.9, 45.7, 46.3.....	45.1	9.60	good	13	-0.08
33	14	6	3878.50	150	6	x1-2v, v5-6k, v3-4n.....	45.4, 46.9, 45.7.....	46.9	9.35	good	15	-0.30
34	22	6	3886.50	150	6	v1x.....	47.4.....	46.0	9.48	good	23	-0.17
35	26	8	3890.58	40	6	x1v, v2-3n.....	45.4, 45.0.....	46.3	9.45	good	27	-0.26
36	Dec. 2	8	3896.58	40	6	x0-1v, v4n.....	45.9, 46.8.....	46.6	9.40	good	33	-0.41
37	9	6	3903.50	150	6	x1v, v5n.....	45.4, 47.8.....	44.2	9.77	fair	40	-0.20
38	12	7	3906.54	80	6	x2v.....	44.4.....	42.8	9.95	fair	43	-0.10
39	20	7	3914.54	150	6	x3v, v2n.....	43.4, 44.8.....	42.0	10.08	poor	51	-0.13
40	1897 Jan. 6	6	3931.50	150	6	x4v, v1n, v2k.....	42.4, 43.8, 42.2.....	39.7	10.40	fair	68	-0.21
41	28	6	3953.50	150	6	n2v, v2k.....	42.4, 42.8.....	34.5	11.11	low	90	+0.01
42	May 28	10	4073.67	..	6	x4v, vn.....	40.8, 42.2.....	.....	< 11.3	low	.....	.....
43	July 8	9	4114.63	..	..	k3v, v5l, v6f.....	37.2, 41.6, 40.5.....	.....	< 12.3	moon	.....	.....
44	Aug. 27	9	4164.63	..	..	v not seen, limit d.....		.....	< 12.6	good	.....	.....
45	Oct. 14	7	4212.54	..	..	v not seen, limit 2 < a.....		.....	< 12.5	good	.....	.....

TABLE 95.—7458 V DELPHINI. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing	I.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
1898												
46	Feb. 15	18	2410000+	...	...	v not seen, limit a	...	...	<12.2	good	...	...
47	Mar. 2	18	4337.00	...	...	v not seen, limit f	...	...	<11.1	fair	...	...
48	15	17	4364.92	...	...	v not seen, limit $1\frac{1}{2}M < k$	...	...	<11.8	fair	...	...
49	23	17	4372.92	150	6	v not seen, limit a	...	...	<12.2	fair	...	...
50	April 1	16	4381.88	150	6	v2a, f5v	29.6, 29.5	29.5	11.83	good	518	+1.43
51	15	16	4395.83	150	6	v3f, v2l, v1d, k6v	37.5, 38.6, 34.5, 34.2	36.7	10.83	good	3	+0.95
52	June 19	10	4460.67	150	6	f1v, v1c, vg	33.5, 31.9, 36.4	33.9	11.21	good	68	+0.61
53	21	13	4462.63	...	12	f1-2v, v1-2c	33.0, 32.4	32.7	11.42	...	70	+0.78
54	July 7	10	4478.67	...	12	d4v, c2-3v, v5a	29.5, 28.4, 32.6	30.2	11.76	good	86	+0.74
55	18	11	4489.71	...	12	d6v, v1a	27.5, 28.6	28.0	12.03	fair	97	+0.75
56	Aug. 9	9	4511.63	...	12	a3-4v, v2-3y	24.1, 22.5	23.3	12.67	good	119	+0.85
57	17	9	4519.63	80	12	a4-5v, v3y, limit y	23.1, 23.0	23.2	12.68	fair	127	+0.65
				80	6	a4v, limit v	23.6					
1899												
58	Jan. 9	6	4664.50	150	6	v not seen, limit a	...	...	<12.2	...	...	...
59	Mar. 22	17	4736.96	150	6	v not seen, limit a	...	...	<12.2	...	...	...
60	Apr. 16	16	4761.92	200	6	v not seen, limit a	...	...	<12.2	...	...	...
61	May 10	15	4785.88	150	6	v not seen, limit $1 < a$	...	...	<12.3	...	...	...
62	29	10	4804.67	150	6	v not seen, limit a	...	...	<12.2	...	...	...
63	June 7	10	4813.67	150	6	v not seen, limit $1 < a$	...	...	<12.3	fair	...	...
64	10	15	4816.88	150	6	v not seen, limit $2 < a$	...	...	<12.4	good	...	...
65	26	10	4832.67	150	6	v not seen, limit $2 < a$	...	...	<12.5	fair	...	...
66	July 8	10	4844.67	150	6	v not seen, limit $4-5 < a$	...	...	<12.7	good	...	...
67	Aug. 10	9	4877.60	150	6	v not seen, limit $2-3 < a$	...	...	<12.4	good	...	...
68	22	9	4889.66	150	6	v not seen, limit a	...	...	<12.2	moon	...	...
69	30	9	4897.60	150	6	v4-5a, vg, f3-4v	32.1, 36.4, 31.0	33.2	11.33	good	505	+0.23
70	Sept. 4	9	4902.60	150	6	v5g, v4f, k2v, m2v	41.4, 38.5, 39.9, 39.9	43.5	9.86	good	510	-0.95
				40	v4-5n, v2x, v1d	48.4, 48.4, 48.4						
71	20	8	4918.56	...	6	v1 $\frac{1}{2}$ M > x, v2e	56.4, 57.2	56.8	7.83	good	526	-2.26
72	Oct. 2	8	4930.56	40	6	v10x, v2-3e	56.4, 57.7	57.1	7.80	good	9	-1.93
73	6	8	4934.56	40	6	v10x, v1e, v5	56.4, 56.2, 56.3	56.3	7.93	good	13	-1.75
74	18	8	4946.56	80	6	v6x	...	52.4	8.52	moon	25	-1.16
75	24	7	4952.54	40	6	v8x±, e4v	54.4, 51.2	52.8	8.46	good	31	-1.34
76	Nov. 3	8	4962.58	40	6	e5v, v4x	50.7, 50.4	50.5	8.83	fair	41	-1.17
77	8	7	4967.54	40	6	e4v, v3x	51.2, 49.4	50.3	8.83	good	46	-1.27
78	15	6	4974.50	40	6	e5-6v, v2-3x	49.7, 48.9	49.3	8.97	good	53	-1.30
79	22	7	4981.52	40	6	e6-8v, v1-2x	48.2, 47.9	48.1	9.15	fair	60	-1.26
80	26	6	4985.50	40	6	e6-8v, v2x	48.2, 48.4	48.3	9.14	fair	64	-1.36
81	Dec. 7	...	4996.	150	6	x2-3v	43.9	44.8	9.85	fair	75	-0.92
				40	x2-3v, v4n	43.9, 46.8						
82	19	6	5008.50	150	6	x6v, n1v, v5-6g	40.4, 41.8, 41.9	41.3	10.15	good	87	-0.89
83	28	7	5017.52	...	...	n4v, v3-4f, v4g	38.8, 38.0, 40.4	39.0	10.50	...	96	-0.75
1900												
84	Jan. 4	6	5024.50	150	6	n5v, vg, v2-3f	37.8, 36.4, 37.0	37.0	10.78	fair	103	-0.65
85	24	6	5044.50	150	6	g4v, f1-2v, v1-2k	32.4, 33.0	32.7	11.40	poor	123	-0.52
86	Mar. 2	14	5081.83	275	12	a6v, v3-4y, limit y	21.6, 23.5	22.7	12.74	fair	160	-0.13
87	May 1	16	5141.92	275	12	v not seen, y glimpsed	...	...	<13	fair	...	...
88	3	14	5143.83	40	40	v is 1 to $1\frac{1}{2}M < y$, μ is $2M < y$	...	...	14.4	...	222	0.0
89	11	15	5151.88	460	40	v is 1 to $1\frac{1}{2}M < y$, $y3-4\pi$	...	...	14.58	poor	230	-0.4±
90	June 8	15	5179.88	237	40	μ seen, but nothing near v	...	...	...	...	...	...
91	19	14	5190.83	350	40	v not seen, limit $1M < y$	...	<2.0	<14	moon	...	...
92	28	13	5199.79	237	40	{ $\mu0-1\pi$, $\pi4-5v$ } { $\mu\pi$ }	...	-0.5	15.44	fair	278	-0.22
93	July 20	12	5221.75	237	40	v not seen, limit μ	...	3.0	15.08	fine	300	-1.00
95	25	12	5226.75	460	40	$\mu5-6v$	...	-3.5	16.0	...	305	-0.1±
96	Aug. 16	13	5248.79	460	40	v not seen, limit μ	...	...	<15	...	...	...
97	29	13	5261.79	700	40	{ v glimpsed, not steadily held } { v is $1\frac{1}{2}$ to $2M < \mu$, and $\frac{1}{2}M < A$ }	...	...	17.0±	fair	340	+0.4±
98	30	10	5262.67	237	40	v or A not seen	...	...	<15	moon	...	...
99	Sept. 6	9	5269.63	237	40	v not seen, limit y	...	...	<13	moon	...	...

TABLE 95.—7458 V DELPHINI. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
100	190		2410000+									
101	Sept. 3	12	5276.75	237	40	v not seen, limit μ			<15	moon	...	...
102	Oct. 4	10	5297.67	237	40	v not seen, limit ω' or $4 < y$			<14	moon	...	...
103	16	9	5309.63	460	40	{ v suspected, not held, limit } $1\mu < \mu$			<16	good	...	...
104	Dec. 11	6	5365.50	150	6	v not seen, limit $4 < a$			<12.8	...	...	...
105	19	6	5373.50	150	6	v not seen, limit $3 < a$			<12.5	...	...	...
106	1901											
107	Oct. 18	8	5676.58	130	12	v not seen, limit y			<13	moon	...	...
108	Nov. 1	8	5690.58	275	12	v not seen, limit $3 < y$			<13.5	good	...	...
109	4	9	5693.63	460	40	v not seen, limit $1-2 < \pi$			<15.1	poor	...	...
110	Dec. 21	6	5740.50	350	40	v not seen, limit π			<15	fair	...	...
111	1902											
112	Mar. 28	15	5837.88	237	40	v not seen, limit $6 < y$			<13.9	moon	...	...
113	Apr. 12	15	5852.88	237	40	{ v not seen, limit $4 < Aor$ } $2-3 < \pi$			<16.7	good	...	...
114	May 8	13	5878.79	460	40	$\varphi 3v, \mu 2v, \mu 2v, \pi 1v$	1.5, 1.5, 0.0, 3.0....	1.5	15.20	fair	428	-0.06
115	29	12	5899.75	237	40	{ $v 3-4\mu, \pi 1\mu, y 8-10v \pm$ } { v is $1\mu. 36 < y$, photometer }.....		5.5	14.66	fair	449	+0.43
116	July 3	10	5934.67	80	12	v not seen, y limit.....			<13	...	...	...
117	Sept. 7	10	6000.67	...	24	photograph, plate.....			10.4	poor	21	+0.8±
118	26	11	6019.63	237	40	{ $v < x$ by $1.09 = 10.37$ } { $v < d$ by $0.91 = 10.21$ }.....			10.29	poor	40	+0.31
119	1903											
120	Apr. 3	15	6208.88	237	40	$v 1-2\mu, v 1-2\pi \pm$	3.5, 5.5.....	4.5	14.90	poor	229	+0.34
121	July 24	10	6320.67	237	40	v not seen, limit $1\mu < y$			<14	poor	...	...
122	Sept. 17	8	6375.58	80	6	v not seen, limit $4 < a$			<12.6	good	...	...
123	Oct. 9	...	6397	...	12	v not seen, limit y			<13	...	...	...
124	25	...	6413	...	12	v not seen, limit y			<13	...	...	...
125	1904											
126	July 31	12	6693.75	150	6	v not seen, limit a			<12	...	...	...
127	Aug. 3	9	6697.63	67	12	v not seen, limit y			<13	...	...	...
128	6	12	6700.75	...	18	$\varphi 4v, \mu 4v, v 3\mu, v 4\pi$	0.5, 2.0, 6.5, 8.0....	3.3	15.00	good	191	+0.14
129	7	11	6700.71	...	12	photographs, Nos. 94, 95.....			<14	good	...	...
130	Oct. 8	11	6762.71	237	40	$\varphi 4v$ or μ, v or $\mu 3\mu$			<15	fair	...	...
131	Nov. 30	7	6815.54	40	6	v not seen, limit $1-2 < a$			<12.3	good	...	...
132	1905											
133	Jan. 3	7	6849.54	237	40	$\varphi 1v$ or μ, v or $\mu 1\mu$			<15	fair	...	...
134	Mar. 12	17	6917.94	450	40	v not seen, limit $2-3\omega$			<14.0	poor	...	...
135	Apr. 4	16	6940.92	750	40	$\varphi 2v, v 2\mu, v 4\mu$	2.5, 5.5, 6.0.....	4.7		fair	436	-0.06
136	11	16	6947.92	750	40	$\varphi 1v, v 3\mu, v 3\mu$	3.5, 6.5, 5.0.....	5.0	14.86	fair	...	...
137	30	15	6966.88	237	40	{ $v 6\mu, v 4\mu, v 1\pi$ } $\omega 8v$	8.0, 8.5, 5.0.....	7.2	14.59	fair	440	-0.19
138	May 22	14	6988.83	450	40	$y 4v, v 5\mu, v 8\mu$	16.0, 9.5, 10.0.....	11.8	14.16	fair	458	+0.36
139	14	14	7001.83	250	40	$y 3-4v, \omega 1v, v 6\omega'$	16.5, 14.0, 16.0.....	16.5	13.57	fair	480	+0.92
140	13	14	7010.83	237	40	$y 3v, v 1\omega$	17.0, 18.0.....					
141	26	11	7023.71	300	12	$v 1-2y, v 1-2\omega$	21.5, 16.5.....	18.2	13.36	fair	493	+1.35
142	July 23	10	7050.67	237	40	$y 1-2v, v 1-2\omega$	18.5, 16.5.....					
143	Aug. 9	9	7067.63	40	6	$v 2y, a 4-5v$	22.0, 23.1.....	22.6	12.79	fair	502	+1.34
144	11	10	7069.67	...	12	$a 4v, v 4-5y$	23.6, 24.5.....	24.0	12.60	good	515	+2.01
145	28	9	7086.63	40	6	$v 2f$		36.5	10.83	good	13	+1.13
146	Sept. 17	8	7106.56	150	6	$v 6-8g, k 1v, v 1m$	43.4, 39.2, 41.9.....	40.9	10.15	good	30	+0.26
147	Oct. 1	10	7120.67	237	40	photographs, Nos. 211, 212.....			10.35	fair	32	...
148	20	7	7139.54	80	12	$k 1v, v 3m, v 5g$	39.2, 43.9, 41.4.....	40.4	10.21	good	49	0.00
149	Dec. 30	6	7210.50	237	40	$m 8v, v 1g, v 4f$	(32.9), 37.4, 38.5....	37.8	10.62	dull	69	0.00
150						$g 1v, v 1f$	35.4, 35.5.....	35.4	10.98	fair	83	+0.05
151						$f 2v, v c, v 5a$	32.5, 30.9, 32.6....	31.9	11.50	good	102	+0.10
152						$y 4v, v 0-1\omega, v 3\sigma$	16.0, 17.0.....	16.5	13.57	good	173	+0.44

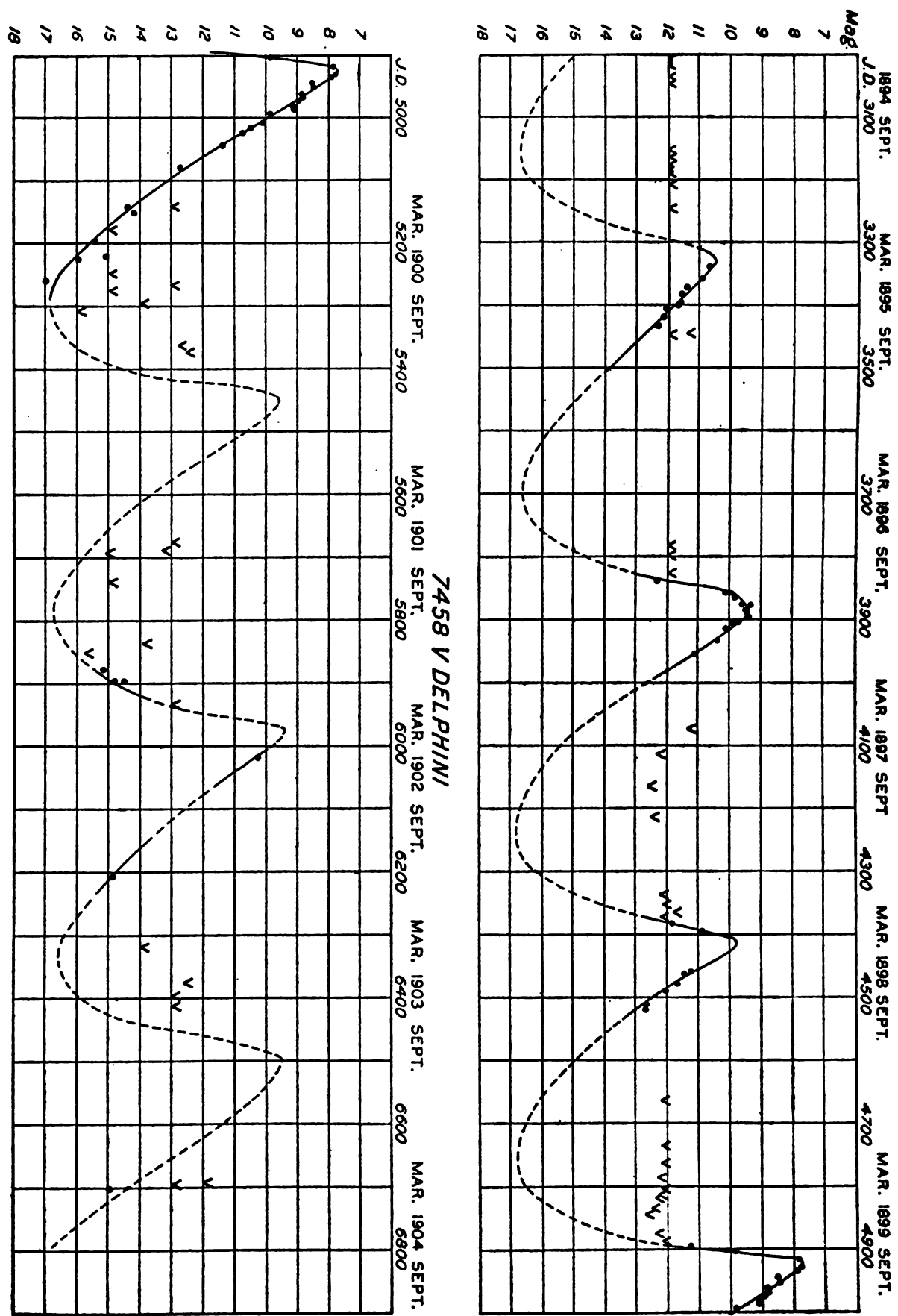


FIG. 32.—LIGHT-CURVE OF V DELPHINI.

TABLE 96.—7458 V DELPHINI. MEAN MAGNITUDES FROM 44½ DAY GROUPS.

Group No.....	1	2	3	4	5	6	7	8	9	10	11	12	
J. D.....	44	88	132	176	220	265	309	353	397	441	485	529	
3334	<i>t</i>	22	66	98	....	....	....	....	....	....	....	517
	<i>M</i>	10.98	11.81	12.35	....	....	....	....	....	....	....	10.80
	ΔM	+1.19	+1.23	+1.06	....	....	....	....	....	....	....	+0.32
	No.	3	5	2	....	....	....	....	....	....	....	3
3863	<i>t</i>	24	60	....	....	....	....	....	....	....	....	518
	<i>M</i>	9.60	10.24	....	....	....	....	....	....	....	....	11.83
	ΔM	-0.20	-0.17	....	....	....	....	....	....	....	....	+1.43
	No.	8	2	....	....	....	....	....	....	....	....	1
4392	<i>t</i>	3	75	114	....	....	....	....	....	....	....	514
	<i>M</i>	10.83	11.46	12.46	....	....	....	....	....	....	....	9.67
	ΔM	+0.95	+0.71	+0.75	....	....	....	....	....	....	....	-0.99
	No.	1	3	3	....	....	....	....	....	....	....	3
4921	<i>t</i>	24	64	107	160	....	226	294	340	....	....	....
	<i>M</i>	8.31	9.35	10.89	12.74	....	14.3±	15.49	17.0±	....	....	....
	ΔM	-1.47	-1.17	-0.64	-0.13	....	-0.2±	-0.44	+0.4±	....	....	....
	No.	5	6	3	1	....	2	3	1	....	....	....
5450	<i>t</i>	....	....	....	....	....	....	....	....	428	449	....
	<i>M</i>	....	....	....	....	....	....	....	....	15.20	14.66	....
	ΔM	....	....	....	....	....	....	....	....	-0.06	+0.43	....
	No.	....	....	....	....	....	....	....	....	1	1	....
5979	<i>t</i>	30	....	....	....	....	229	....	....	....	....	....
	<i>M</i>	10.34	....	....	....	....	14.90	....	....	....	....	....
	ΔM	+0.56	....	....	....	....	+0.34	....	....	....	....	....
	No.	2	....	....	....	....	1	....	....	....	....	....
6508	<i>t</i>	....	....	....	....	191	....	....	....	429	....	....
	<i>M</i>	....	....	....	....	15.0±	....	....	....	14.77	....	....
	ΔM	....	....	....	....	+1.4±	....	....	....	-0.39	....	....
	No.	....	....	....	....	1	....	....	....	3	....	....
7037	<i>t</i>	....	....	....	....	....	....	....	....	....	....	....
	<i>M</i>	....	....	....	....	....	....	....	....	....	....	....
	ΔM	....	....	....	....	....	....	....	....	....	....	....
	No.	....	....	....	....	....	....	....	....	....	....	....
Means	<i>t</i>	23	66	107	160	191	227	294	340	429	449	516
	<i>M</i>	9.62	10.63	11.85	12.74	15.0±	14.50	15.49	17.0±	14.88	14.66	10.46
	ΔM	-0.17	+0.06	+0.31	-0.13	+1.4±	-0.02	-0.44	+0.4±	-0.31	+0.43	-0.08
	No.	19	16	8	1	1	3	3	1	4	1	7

MAGNITUDE-CURVE.

Fig. 31 gives a graphic view of the relation between the visual and photometric magnitudes. From this curve are taken the magnitudes of the stars not measured photometrically, and also the magnitude of the variable. The deviation of the star *v* from the curve seems greater than is allowable; this is explained by the fact that its place in the light scale depends on but one comparison with the variable, and therefore the effect of an error is slight.

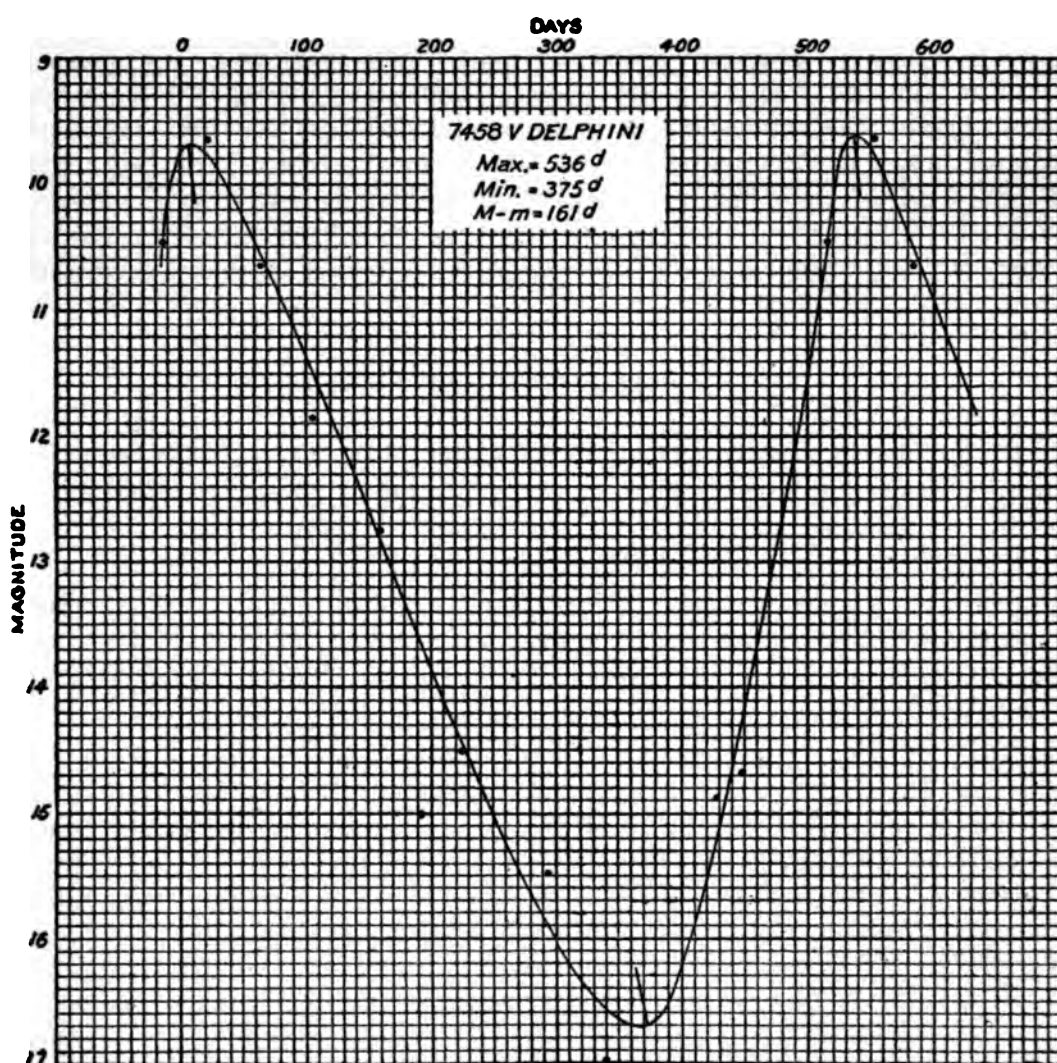


FIG. 33.—MEAN LIGHT-CURVE FOR V DELPHINI.

LIGHT-CURVE.

Fig. 32 shows the star's variations from June, 1894, to August, 1904, the parts of the curve determined by the observations being drawn full, the parts assumed, with a broken line. When the variable was invisible the limit of vision is indicated by the point of the V-shaped characters. It will be seen that the observations fix definitely the number of maxima possible during this interval, determine the time of maximum for epochs 4, 5, and 6, with considerable certainty, and of epochs 3 and 8 less definitely, and show that the magnitude at minimum is in the neighborhood of 17.

The striking characteristics of the star's variation are its great range, but little less than 10 magnitudes, and its rapid rise to maximum, best shown at epoch 6. The curve at maximum is usually quite sharp, though this is not confirmed by the observations of Reed at Harvard in 1891, published in *Astronomical Journal*, 13, 63. Further reference to these observations will be made later. The shape of the curve near minimum can be inferred by combining the observations on the descending branch of the curve following maximum 6 in 1900, and those on the ascending branch preceding maximum 8 in 1902. Combining these observations with the limit of vision when the star was not seen, the curve at minimum is fixed very nearly as drawn.

PERIOD OF VARIATION.

The elements of maximum given by Chandler in his Third Catalogue and retained in his "Revised Elements," published in 1904

$$1890 \text{ December } 20 (2411722) + 540^d\text{E.}$$

are based on six maxima between 1890 and 1899, fitting the first five maxima very well, but requiring a correction of -34 days for epoch 6, and about -80 days at epoch 9. The observations now available are represented better by the elements,

$$1891 \text{ January } 14 (2411747) + 529^d\text{E.}$$

This was obtained by using only the best observed maxima, 2, 4, and 6, and shortening the period thus obtained 2 days on account of the last maximum in the light-curve, No. 9.

In this connection two sets of observations require separate consideration. First, Mrs. Fleming's measures from the photographs, published in *Astronomische Nachrichten*, 127, 5, showing that the star was invisible, less than 10th magnitude, on six dates from June 30 to October 28, 1890, and photographically 9.3 magnitude, November 28; 8.6 on December 19; 9.0 December 20, and 8.7 on December 22. Considering the small number and range on these plates it is thought that no violence is done to them by assuming the date of maximum to be as late as January 14. Second, a set of observations made at Harvard by W. M. Reed, and published in *Astronomical Journal* 13, 63, are not in accord with the above elements and mean light-curve. They are given in Table 97, with the addition of three columns giving respectively the Julian day, the number of days after the preceding maximum as calculated by the foregoing elements, and the corresponding magnitude from the mean light-curve.

TABLE 97.

Reed.		J. D.	D.	Mag. from curve.
Date.	Mag.			
1891 May 28	9.2	1881	+134	12.6
June 9	9.1	1893	+146	12.9
June 15	9.0	1899	+152	13.0
July 9	9.0	1923	+176	13.5
July 27	9.2	1941	+194	13.9
Aug. 20	...	....	...	....
Sept. 2	9.4	1978	+231	14.6
1892 Nov. 3	9.0	2406	+130	12.6

If Chandler's elements are used the intervals after maxima will be still greater, so that a considerable change in period or form of curve must be assumed to explain the discrepancy, unless the star was misidentified.

NOTE.—The well observed maximum of epoch 10, completed since the above was written, gives a correction to the ephemeris of +34 days. Using the three best determined maxima, the period between epochs 4 and 6 is 524 days, between 6 and 10 it is 539 days, giving a mean period of 533 days, and indicating a secondary term in the elements, which will require further observations to definitely fix.

TABLE 98.—7458 V DELPHINI. OBSERVED MAXIMA AND MINIMA.
Elements of maximum. 1891 Jan. 14 (J. D 2411747)+529^d R. M - m = 1614.

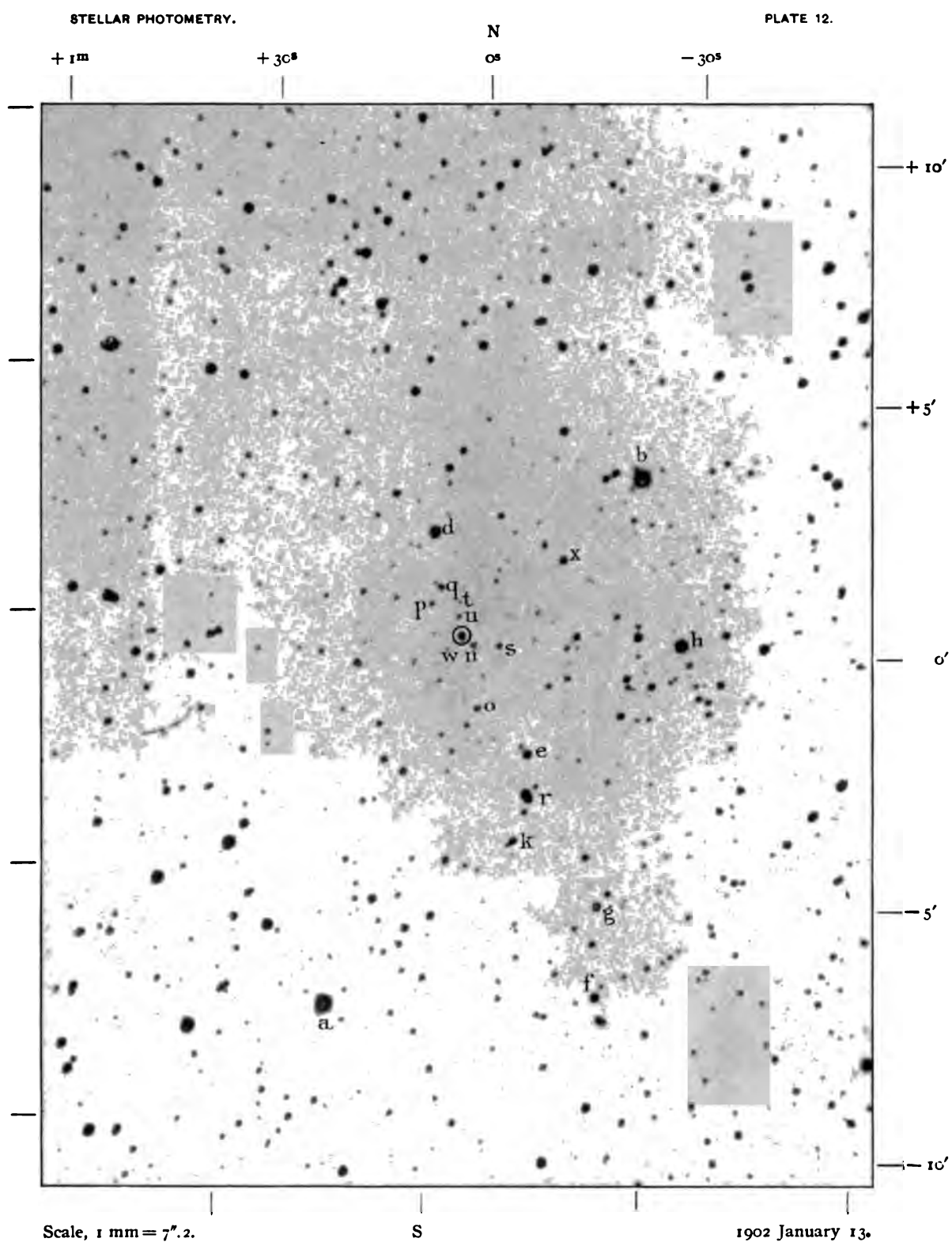
MAXIMA.							MINIMA.						
Epoch.	Date.		Mag.		Corr.	Wt.	Epoch.	Date.		Mag.		Corr.	Wt.
	Calendar.	J. D.	H.	P.				Calendar.	J. D.	H.	P.		
3	1895 May 15	3329	10.50	10.76	-10	6	4	1896 May 30	3710	....	mc	+3	1
4	1896 Nov. 16	3880	9.40	9.66	+12	19	5	1897 Nov. 18	4247	....	mc	+11	1
5	1898 May 5	4415	....	mc	+18	10	7	1900 Sept. 27	5290	17.0	17.3	-4	8
6	1899 Oct. 1	4929	....	mc	+3	24	8	1902 Feb. 26	5807	....	mc	-16	2
7	1901 Mar. 16	5455	7.80	8.08	+5	1	9	1903 Aug. 23	6350	....	mc	-2	2
8	1902 Aug. 22	5984	10.0	10.3	0	4	10	1905 Jan. 4	6850	....	mc	-35	2
9	1904 Jan. 20	6500	....	mc	-13	1							
10	1905 Aug. 18	7076	10.10	10.36	+34	20							

TABLE 101.—COMPARISON STARS FOR Z CASSIOPEÆ (IN ORDER OF RIGHT ASCENSION).

Star.	Coordinates from Variable.			Light Scale, Steps.	Magnitude.			
	R. A.		Dec.		Measured.		From Curve.	
	"	s	"		H.	P.	H.	P.
<i>h</i>	—276	—32.9	+ 3	37.0	10.75	10.64	.....	.....
<i>b</i>	—208	—24.8	+200	44.1	9.79	9.68	.....	.....
<i>f</i>	—188	—22.4	—420	.....	.....	.....	.....	.....
<i>g</i>	—182	—21.7	—311	27.5	11.97	11.86	.....	.....
<i>x</i>	—117	—13.9	+ 97	17.1	13.38	13.27	.....	.....
<i>l</i>	— 92	—11.0	—188	.....	.....	.....	.....	.....
<i>r</i>	— 89	—10.6	—182	31.5	.....	.....	11.45	11.34
<i>e</i>	— 88	—10.5	—137	23.1	12.25	12.14	.....	.....
<i>k</i>	— 78	— 9.3	—239	21.6	12.99	12.88	.....	.....
<i>s</i>	— 47	— 5.6	— 8	6.0	.....	.....	14.32	14.21
<i>o</i>	— 23	— 2.7	— 83	9.9	13.96	13.85	.....	.....
<i>n</i>	— 17	— 2.0	— 9	8.0	13.96	13.85	.....	.....
<i>i</i>	+ 3	+ 0.4	+ 40	1.0	.....	.....	14.88	14.77
<i>u</i>	+ 4	+ 0.5	+ 22	1.5	.....	.....	14.82	14.71
<i>w</i>	+ 17	+ 2.0	— 17	0.0	.....	.....	15.00	14.89
<i>q</i>	+ 28	+ 3.3	+ 57	11.0	13.72	13.61	.....	.....
<i>d</i>	+ 40	+ 4.8	+121	36.4	10.94	10.83	.....	.....
<i>p</i>	+ 40	+ 4.8	+ 37	10.0	13.64	13.53	.....	.....
<i>a</i>	+139	+16.6	—448	.....	8.32	8.21	.....	.....

TABLE 102.—8518 Z CASSIOPEÆ. PHOTOMETER MEASURES OF COMPARISON STARS.

1904 September 5.			6-INCH.			Good, a little dull.		
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
<i>h m</i> 20 39	31	<i>D_{at}</i>	13.3 12.8 13.4	13.17	12.95	0.63	7.94	7.83
		<i>E</i>	14.3 13.7 15.0	14.33	14.33	0.84	8.15	8.04
		<i>A_{at}</i>	10.0 9.0 9.9	9.63	9.55	0.24	7.55	7.44
		<i>a</i>	17.0 15.8 15.9	16.23	16.62	1.17	8.48	8.37
		<i>h</i>	37.5 39.9 38.2	38.53	37.82	3.65	10.96	10.85
		<i>b</i>	24.5 25.1 25.0	24.87	25.22	2.15	9.46	9.35
	30	<i>d</i>	39.5 39.9 39.8	39.73	39.78	3.82	11.13	11.02
		<i>d</i>	40.0 39.7 39.8	39.83	.....	.....	.....	.....
		<i>b</i>	24.9 25.9 25.9	25.57	.....	.....	.....	.....
		<i>h</i>	37.1 37.3 36.9	37.10	.....	.....	.....	.....
		<i>a</i>	17.2 17.0 16.8	17.00	.....	.....	.....	.....
		<i>A_{at}</i>	9.2 9.3 9.9	9.47	.....	.....	.....	.....
	28	<i>E</i>	14.3 14.8 13.9	14.33	.....	.....	.....	.....
		<i>D_{at}</i>	12.2 12.9 13.1	12.73	.....	.....	.....	.....
20 59								



S

8518 Z CASSIOPEIÆ.
R. A. 23^h 39^m 39^s.9. Dec. + 56° 1' 33", 1900.

TABLE 102.—8518 Z CASSIOPEÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1904 October 1.			6-INCH.					
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
<i>h m</i> 22 32	° 17	<i>E</i> <i>A_{at}</i> <i>D_{at}</i> <i>a</i> <i>d</i> <i>b</i> <i>h</i> <i>h</i> <i>b</i> <i>d</i> <i>a</i> <i>D_{at}</i> <i>A_{at}</i> <i>E_{at}</i> <i>E</i>	14.7 15.3 14.7 9.8 9.9 9.0 14.0 13.3 13.7 15.3 15.9 15.7 38.2 38.3 38.1 28.4 27.9 28.1 37.9 38.2 38.6 38.3 38.7 39.0 28.2 29.1 28.3 38.9 39.1 39.0 16.8 16.3 16.3 14.2 13.8 13.7 9.9 10.1 9.1 20.9 21.3 22.0 13.4 14.0 13.3	14.90 9.57 13.67 15.63 38.20 28.13 38.23 38.67 28.53 39.00 16.47 13.90 9.70 21.40 13.57	14.24 9.64 13.79 16.05 38.60 28.33 38.45	0.82 0.25 0.76 1.09 3.71 2.49 3.70	8.07 7.50 8.01 8.34 10.96 9.74 10.95	7.96 7.39 7.90 8.23 10.85 9.63 10.84
22 52	15							
1904 October 5. Floating clouds.								
21 20	27	<i>A_{at}</i> <i>E_{at}</i> <i>D_{at}</i> <i>a</i>	8.2 8.2 7.5 18.4 17.8 18.6 12.2 12.3 12.0 13.4 13.5 14.2	7.97 18.27 12.17 13.70	..... ..... ..... 13.52	0.12 1.38 0.52 0.72	7.55 8.81 7.95 8.15	7.44 8.70 7.84 8.04
21 37	25	<i>d</i> <i>b</i> <i>h</i> <i>h</i> <i>b</i> <i>d</i> <i>a</i>	38.3 38.9 38.2 23.5 23.3 23.9 36.1 36.0 35.6 36.6 36.1 36.3 24.7 25.2 25.8 37.8 37.4 38.0 13.3 13.4 13.3	38.47 23.57 35.90 36.33 25.23 37.73 13.33	38.10 24.40 36.12	3.67 2.07 3.42	11.10 9.50 10.85	10.99 9.39 10.74
1904 October 27. Fine.								
20 34	33	<i>D_{at}</i> <i>E</i> <i>A_{at}</i> <i>a</i> <i>d</i> <i>b</i> <i>h</i> <i>h</i> <i>b</i> <i>d</i> <i>a</i> <i>A_{at}</i> <i>E_{at}</i> <i>E</i> <i>D_{at}</i> <i>D_{at}</i>	15.2 14.9 14.9 13.0 13.1 13.0 8.7 9.4 8.8 14.7 14.9 15.1 38.6 39.2 39.3 24.3 25.2 24.9 38.2 37.7 37.0 37.7 37.6 37.8 27.7 27.1 27.2 39.5 39.7 39.2 15.1 14.6 15.1 9.2 9.0 9.0 20.0 19.3 19.7 12.9 13.3 13.0 12.4 13.2 12.9 14.2 14.0 14.1	15.00 13.03 8.93 14.90 39.03 24.80 37.63 37.70 27.33 39.47 14.93 9.07 19.67 13.07 13.47	14.24 13.05 9.00 14.92 39.25 26.07 37.67	0.82 0.65 0.18 0.93 3.77 2.25 3.63 1.55	8.07 7.90 7.43 8.18 11.02 9.50 10.88 8.80	7.96 7.79 7.32 8.07 10.91 9.39 10.77 8.69
20 57	29							

TABLE 192.—8518 Z CASSIOPEÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1904 September 11.			12-INCH.				Good.		
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.		
				Mean of 3.	Mean of 6.		H.	P.	
<i>h m</i>	<i>°</i>								
19 26	41	<i>aα1</i>	13.3 13.4 13.1	13.27	13.50	0.85	9.17	9.06	
		<i>k</i>	47.3 49.3 48.8	48.47	47.99	4.62	12.94	12.83	
		<i>e</i>	40.1 41.0 40.9	40.67	40.74	3.86	12.18	12.07	
		<i>g</i>	37.7 38.2 38.3	38.06	38.58	3.61	11.93	11.82	
		<i>v</i>	49.1 47.4 47.2	47.90	48.07	4.63	12.95	12.84	
		<i>d</i>	30.0 28.8 29.2	29.67	29.92	2.64	10.96	10.85	
		<i>b</i>	18.0 18.8 18.2	18.33	18.45	1.50	9.82	9.71	
		<i>h</i>	26.1 26.5 27.3	26.63	27.02	2.38	10.70	10.59	
		<i>h</i>	27.5 27.7 27.0	27.40	.....	.....	.....	.....
		<i>b</i>	18.7 19.0 18.0	18.57	.....	.....	.....	.....
		<i>d</i>	30.4 30.0 30.1	30.17	.....	.....	.....	.....
		<i>v</i>	47.8 48.1 48.8	48.23	.....	.....	.....	.....
		<i>g</i>	39.3 39.0 39.0	39.10	.....	.....	.....	.....
		<i>e</i>	41.0 41.0 40.4	40.80	.....	.....	.....	.....
		<i>k</i>	46.5 47.7 48.3	47.50	.....	.....	.....	.....
19 50	38	<i>aα1</i>	13.5 13.6 14.1	13.73	.....	.....	.....	.....
1904 November 2.			Fair to good, quiet, dull.						
20 36	31	<i>a</i>	12.1 11.2 12.0	11.77	11.70	0.63	8.38	8.27	
		<i>d</i>	35.0 35.0 35.0	35.00	34.84	3.18	10.93	10.82	
		<i>b</i>	24.3 22.9 23.3	23.50	23.42	2.06	9.81	9.70	
		<i>h</i>	32.7 31.5 32.5	32.23	32.58	2.93	10.68	10.57	
		<i>e</i>	47.7 48.6 47.2	47.83	46.93	4.51	12.26	12.15	
		<i>k</i>	57.7 59.7 57.3	58.23	58.60	5.43	13.18	13.07	
		<i>g</i>	43.3 44.0 43.8	43.70	44.04	4.22	11.97	11.86	
		<i>g</i>	44.8 44.0 44.3	44.37	.....	.....	.....	.....
		<i>k</i>	59.2 57.8 59.9	58.97	.....	.....	.....	.....
		<i>e</i>	46.1 45.2 46.8	46.03	.....	.....	.....	.....
		<i>h</i>	34.0 33.0 31.8	32.93	.....	.....	.....	.....
		<i>b</i>	23.2 23.6 23.2	23.33	.....	.....	.....	.....
		<i>d</i>	35.0 34.8 34.2	34.67	.....	.....	.....	.....
20 56	29	<i>a</i>	12.3 11.5 11.1	11.63	.....	.....	.....	.....
1904 November 3.			Twilight at beginning, good.						
20 37	32	<i>a</i>	7.0 8.1 7.2	7.43	7.27	0.23	8.25	8.14	
		<i>d</i>	32.3 32.1 32.1	32.17	32.42	2.90	10.92	10.81	
		<i>b</i>	19.9 19.3 19.6	19.60	20.04	1.72	9.74	9.63	
		<i>h</i>	32.8 31.1 32.1	32.00	31.87	2.85	10.87	10.76	
		<i>e</i>	44.8 44.9 45.4	45.03	44.82	4.30	12.32	12.21	
		<i>k</i>	49.5 49.6 49.7	49.60	50.40	4.84	12.86	12.75	
		<i>g</i>	41.8 41.8 42.3	41.97	41.94	4.00	12.02	11.91	
		<i>g</i>	41.5 42.0 42.2	41.90	.....	.....	.....	.....
		<i>k</i>	51.6 51.3 50.7	51.20	.....	.....	.....	.....
		<i>e</i>	45.5 43.6 44.7	44.60	.....	.....	.....	.....
		<i>h</i>	31.0 32.0 32.2	31.73	.....	.....	.....	.....
		<i>b</i>	19.9 21.2 20.3	20.47	.....	.....	.....	.....
		<i>d</i>	33.3 32.6 32.1	32.67	.....	.....	.....	.....
		<i>a</i>	6.0 8.1 7.2	7.10	.....	.....	.....	.....
20 56	29	<i>aα1</i>	14.7 15.2 15.1	15.00	.....	.....	.....	.....

TABLE 102.—8518 Z CASSIOPEIÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1900 July 12.		40-INCH, WEDGE II.					Moon.	
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
<i>h m</i> 21	<i>°</i>	<i>d</i>	11.2 16.0 14.0 15.2	14.10	.....	0.56	10.87	10.76
		<i>x</i>	34.4 31.8 32.9 32.7	32.95	31.78	3.07	13.38	13.27
		<i>s</i>	45.1 44.0 44.9 44.2	44.55	.....	4.46	14.77	14.66
		<i>e</i>	26.0 24.7 24.8 23.1	24.65	.....	2.20	12.51	12.40
		<i>o</i>	37.5	37.5	.....	3.65	13.96	13.85
		<i>a</i>	34.5 35.0 33.9 37.4	35.20	.....	3.41	13.72	13.61
		<i>k</i>	26.7 29.9 28.3 29.0	28.48	.....	2.70	13.01	12.90
		<i>q</i>	34.1 35.3 35.4 35.0	34.95	.....	3.38	13.69	13.58
		<i>x</i>	30.2 30.3 31.0 30.9	30.60	.....	.....	.....	.....
		<i>h</i>	10.9 12.8 11.0 10.8	11.38	.....	0.23	10.54	10.34
1900 October 24.			WEDGE II.			Seeing variable.		
		<i>b</i>	15.0 17.1 15.7	15.93	.....	0.83	9.37	9.26
		<i>d</i>	28.2 27.7 28.7	28.20	27.39	2.56	11.10	10.99
		<i>q</i>	54.5 53.3 53.5	53.77	52.27	5.13	13.67	13.56
		<i>p</i>	55.0 53.1 55.0	54.37	52.75	5.18	13.72	13.61
		<i>v</i>	53.0 55.3 51.2	53.17	51.62	5.10	13.64	13.53
		<i>n</i>	58.3 58.1 57.2	57.87	56.74	5.50	14.04	13.93
		<i>e</i>	35.8 37.7 37.9	37.13	36.77	3.57	12.11	12.00
		<i>k</i>	44.2 44.9 43.6	44.23	44.05	4.40	12.94	12.83
		<i>g</i>	37.2 37.8 37.8	37.60	37.22	3.62	12.16	12.05
		<i>g</i>	37.8 36.7 36.0	36.83	.....	.....	.....	.....
		<i>k</i>	43.5 43.8 44.3	43.87	.....	.....	.....	.....
		<i>e</i>	35.0 37.0 37.2	36.40	.....	.....	.....	.....
		<i>n</i>	54.2 55.9 56.7	55.60	.....	.....	.....	.....
		<i>v</i>	50.0 49.0 51.2	50.07	.....	.....	.....	.....
		<i>p</i>	50.2 52.1 51.1	51.13	.....	.....	.....	.....
		<i>q</i>	49.9 52.4 50.0	50.77	.....	.....	.....	.....
2 15		<i>d</i>	24.3 27.2 28.2	26.57	.....	.....	.....	.....
1905 January 3.			WEDGE V.			Good.		
		<i>g</i>	24.3 24.8 25.9	25.00	23.10	2.04	12.06	11.95
		<i>k</i>	31.9 33.0 31.6	32.17	31.04	2.77	12.79	12.68
		<i>e</i>	26.0 27.8 27.3	27.03	26.55	2.33	12.35	12.24
		<i>n</i>	41.7 41.7 41.5	41.63	41.00	3.89	13.91	13.80
		<i>v</i>	55.7 56.4 57.4	56.50	56.38	5.31	15.33	15.22
		<i>p</i>	38.7 37.9 37.3	37.97	38.05	3.56	13.58	13.47
		<i>q</i>	39.4 39.3 40.6	39.77	39.65	3.74	13.76	13.65
		<i>q</i>	39.5 40.0 39.1	39.53	.....	.....	.....	.....
		<i>p</i>	38.1 38.3 38.0	38.13	.....	.....	.....	.....
		<i>v</i>	54.2 56.8 57.8	56.27	.....	.....	.....	.....
		<i>n</i>	41.2 39.1 40.8	40.37	.....	.....	.....	.....
		<i>e</i>	27.0 25.5 25.7	26.07	.....	.....	.....	.....
		<i>k</i>	30.0 29.9 29.8	29.90	.....	.....	.....	.....
3 0		<i>g</i>	20.2 21.2 22.2	21.20	.....	.....	.....	.....

TABLE 102.—8518 Z CASSIOPEIÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1905 January 7.			WEDGE V.				Clear, unsteady.		
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.		
				Mean of 3.	Mean of 6.		H.	P.	
h m	°								
3 24	38	g	25.0 25.5 25.4	25.30	24.90	2.19	12.08	11.97	
		h	31.5 32.7 32.8	32.33	32.62	2.93	12.82	12.71	
		e	28.7 28.9 29.7	29.10	27.52	2.42	12.31	12.20	
		n	41.8 42.9 42.0	42.23	42.46	4.05	13.94	13.83	
		v	53.8 54.4 55.2	54.47	55.27	5.24	15.13	15.02	
		p	39.1 39.3 39.7	39.37	39.54	3.73	13.62	13.51	
		q	41.1 40.9 40.2	40.73	40.82	3.87	13.76	13.65	
		p	41.1 41.1 40.4	40.90	.....	.....	.....	.....
		p	39.1 39.2 40.8	39.70	.....	.....	.....	.....
		v	55.7 56.2 56.3	56.07	.....	.....	.....	.....
		n	42.2 42.8 43.1	42.70	.....	.....	.....	.....
		e	23.9 25.3 24.7	24.63	.....	.....	.....	.....
		k	33.3 32.5 32.9	32.90	.....	.....	.....	.....
		g	23.8 24.7 25.0	24.50	.....	.....	.....	.....
		e	25.5 27.3 28.9	27.23	.....	.....	.....	.....
	39								

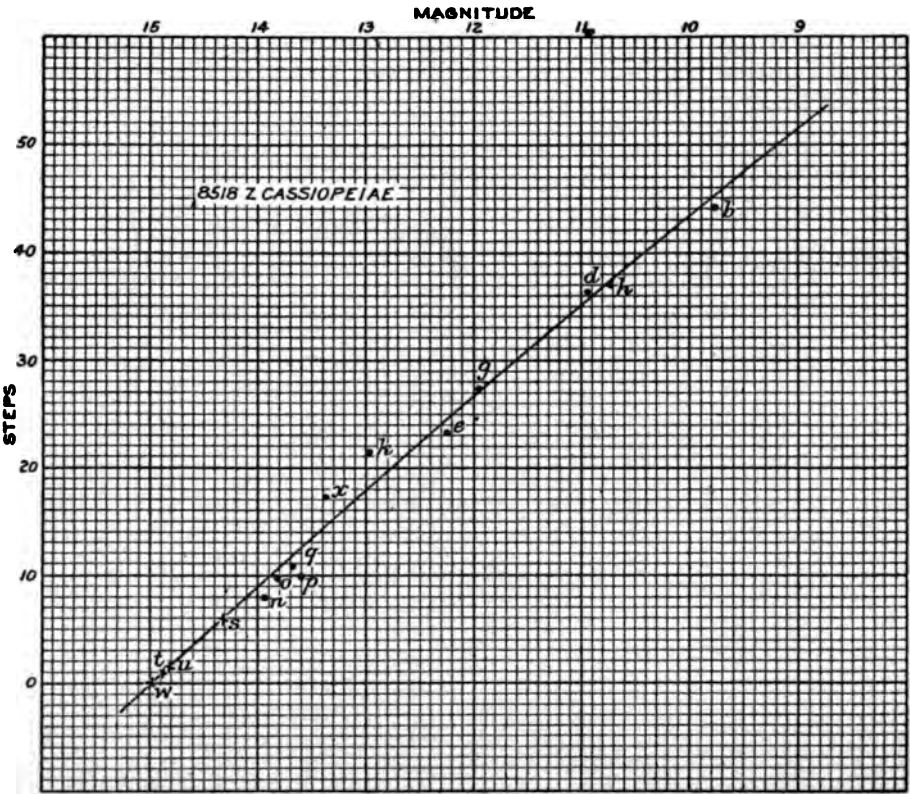


FIG. 34.—MAGNITUDE-CURVE FOR Z CASSIOPEIÆ.

TABLE 103.—8518 Z CASSIOPEÆ. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

6-INCH.										
Star.	1904 September 5.					1904 October 1.				
	C.	Obs. Mag.		Δ Mag.		C.	Obs. Mag.		Δ Mag.	
		H.	P.	H.	P.		H.	P.	H.	P.
A	-0.51	6.80	6.69	+ .32	+ .11	-0.50	6.75	6.64	+ .27	+ .06
D	-0.12	7.19	7.08	- .32	- .12	0.01	7.26	7.15	- .25	- .05
Means.....	.....	7.00	6.89	± .32	± .12	-0.25	7.00	6.89	± .26	± .06
M ₀.....	.....	7.31	7.20	.....	.....	.....	7.25	7.14	.....	.....
Star.	1904 October 5.					1904 October 27.				
	C.	Obs. Mag.		Δ Mag.		C.	Obs. Mag.		Δ Mag.	
		H.	P.	H.	P.		H.	P.	H.	P.
A	-0.63	6.80	6.69	+ .32	+ .11	-0.57	6.68	6.57	+ .20	- .01
D	-0.23	7.20	7.09	- .31	- .11	0.07	7.32	7.21	- .19	+ .01
Means	-0.43	7.00	6.89	± .32	± .11	-0.25	7.00	6.89	± .20	± .01
M ₀.....	.....	7.43	7.32	.....	.....	.....	7.25	7.14	.....	.....
12-INCH.					40-INCH.					
Star.	Mag. 6-inch.	C.			Star.	Mag. 12-inch.	C.			
		Sept. 11.	Nov. 2.	Nov. 3.			July 12.	Oct. 24.	Jan. 3.	Jan. 7.
a	8.29	0.01	0.63	0.23	d	10.94	0.56	.....	.....	.....
b	9.55	1.50	2.06	1.72	e	12.25	2.20	3.57	2.33	2.42
d	11.05	2.64	3.18	2.90	h	10.75	0.23	.....	.....	.....
h	10.91	2.38	2.93	2.85	k	12.99	2.70	4.40	2.77	2.93
					g	11.97	.....	3.62	2.04	2.19
Mean C ...	.....	1.63	2.20	1.93	Mean C ..	.....	1.42	3.86	2.38	2.51
Mean Mag.	9.95	9.95	9.95	9.95	MeanMag.	.....	11.73	12.40	12.40	12.40
M ₀.....	.....	8.32	7.75	8.02	M ₀.....	.....	10.31	8.54	10.02	9.89

TABLE 104.—8518 Z CASSIOPEÆ. MEAN MAGNITUDES OF COMPARISON STARS.

6-INCH.											
Star.	September 5.		October 1.		October 5.		October 27.		Mean.		
	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag. H.	Mag. P.	Δ Mag.
A ..	6.80	+0.04	6.75	−0.01	6.80	+0.04	6.68	−0.08	6.76	6.65	±0.04
D ..	7.19	−0.05	7.26	+0.02	7.20	−0.04	7.32	+0.08	7.24	7.13	±0.05
Mean									7.00	6.89	±0.04
a...	8.48	+0.19	8.34	+0.05	8.15	−0.14	8.18	−0.11	8.29	8.18	±0.12
b...	9.46	−0.09	9.74	+0.19	9.50	−0.05	9.50	−0.05	9.55	9.44	±0.09
d...	11.13	+0.08	10.96	−0.09	11.10	+0.05	11.02	−0.03	11.05	10.94	±0.06
h...	10.96	+0.05	10.95	+0.04	10.85	−0.06	10.88	−0.03	10.91	10.80	±0.04
Mean									9.95	9.84	±0.08
E...	8.15	+0.11	8.07	+0.03	8.06	+0.02	7.90	−0.14	8.04	7.93	±0.08

12-INCH.											
Star.	September 11.		November 2.		November 3.		Mag.	Δ Mag.	Mean.		
	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.			Mag. H.	Mag. P.	Δ Mag.
a...	8.33	+0.01	8.38	+0.06	8.25	−0.07	.....	.....	8.32	8.21	±0.05
b...	9.82	+0.03	9.81	+0.02	9.74	−0.05	.....	.....	9.79	9.68	±0.03
d...	10.96	+0.02	10.93	−0.01	10.92	−0.02	.....	.....	10.94	10.83	±0.02
h...	10.70	−0.05	10.68	−0.07	10.87	+0.12	.....	.....	10.75	10.64	±0.08
Mean									9.95	9.84	±0.04
e...	12.18	−0.07	12.26	+0.01	12.32	+0.07	.....	.....	12.25	12.14	±0.05
f...	11.93	−0.04	11.97	0.00	12.02	+0.05	.....	.....	11.97	11.86	±0.03
h...	12.94	−0.05	13.18	+0.19	12.86	−0.13	.....	.....	12.99	12.88	±0.12
Mean									12.40	12.29	±0.07

40-INCH.											
Star.	January 3.		January 7.		July 12.		October 24.		Mean.		
	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag.	Δ Mag.	Mag. H.	Mag. P.	Δ Mag.
d...	.....	.....	.....	.....	10.87	−0.12	11.10	+0.12	10.98	10.87	±0.12
e...	12.35	+0.03	12.31	−0.01	12.51	+0.19	12.11	−0.21	12.32	12.21	±0.11
h...	.....	.....	.....	.....	10.54	.....	.....	.....	(10.54	10.43)	.....
k...	12.79	−0.10	12.82	−0.07	13.01	+0.12	12.94	+0.05	12.89	12.78	±0.08
g...	12.06	−0.04	12.08	−0.02	.....	.....	12.16	+0.06	12.10	11.99	±0.04
Mean									.....	.....	±0.06
n ..	13.91	−0.05	13.94	−0.02	.....	.....	14.04	+0.08	13.96	13.85	±0.05
p ..	13.58	−0.06	13.62	−0.02	.....	.....	13.72	+0.08	13.64	13.53	±0.05
q...	13.76	+0.04	13.76	+0.04	13.69	−0.03	13.67	−0.05	13.72	13.61	±0.04
x...	.....	.....	.....	.....	13.38	.....	.....	.....	(13.38	13.27)	.....
o...	.....	.....	.....	.....	13.96	.....	.....	.....	(13.96	13.85)	.....
Mean									.....	.....	±0.05

TABLE 105.—8518 Z CASSIOPEÆ. VISUAL OBSERVATIONS OF THE VARIABLE.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
1	1898 Nov. 11	..	2410000+	...	2	photograph, d3v, vir.....	33.4, 32.5.....	33.0	11.3±	....	0	+0.6±
2	1899 Jan. 4	..	4659	80	6	v5m', m'4g, m'6e.....	.....	34.4	11.10	fair	54	+0.08
3	9	7	4664.52	150	6	v3-4m', m'6e.....	.....	32.9	11.29	....	59	+0.21
4	14	7	4669.54	40	6	m' is double, 11 and 12m }	.....	32.4	11.32	....	64	+0.17
5	19	7	4674.54	150	6	v3m', m'5g, limit k.....	.....	31.9	11.40	fair	69	+0.19
6	24	6	4679.50	150	6	v2-3m', m'3g, g3e, e2-3k.....	.....	31.4	11.45	fair	74	+0.15
7	Feb. 7	7	4693.52	200	6	v2m', m'5e.....	.....	29.4	11.68	good	88	+0.19
8	18	7	4704.54	150	6	g4e, e3k, m'v.....	.....	29.8	11.69	good	99	+0.02
9	24	7	4710.54	150	6	d5v, v5e.....	31.4, 28.1.....	<32	<11.4	....	....	....
10	28	7	4714.54	150	6	v not seen, limit 4 < d.....	.....	24.0	12.31	fair	109	+0.50
11	Mar. 7	7	4721.54	80	6	erv, d1ov.....	22.1, 26.4.....	24.3	12.27	fair	116	+0.30
12	13	8	4727.56	150	6	v1e, g4v, d1ov±.....	24.1, 23.5, 26.4.....	23.3	12.38	good	122	+0.31
13	28	8	4742.56	150	6	g2v, ve, limit v.....	25.5, 23.1.....	21.1	12.64	fair	137	+0.37
14	Apr. 4	16	4749.92	...	6	g4v, ve.....	23.5, 23.1.....	23±	12.4±	poor	144	0.0±
15	16	16	4761.92	200	6	e2-3v, vk.....	20.6, 21.6.....	<23	<12.4	....	....	....
16	21	16	4766.92	200	6	ev±, uncertain.....	.....	<21	<12.6	....	....	....
17	May 10	16	4785.92	...	6	v not seen, limit e.....	.....	<23	<12.4	....	....	....
18	21	15	4796.88	150	6	v not seen, limit e.....	.....	<23	<12.4	....	....	....
19	29	10	4804.67	150	6	v not seen, limit e.....	.....	<23	<12.4	....	....	....
20	June 7	10	4813.67	150	6	v not seen, limit e.....	.....	<23	<12.4	....	....	....
21	10	14	4816.83	150	6	v not seen, limit k.....	.....	<22	<12.5	....	....	....
22	July 5	11	4841.71	150	6	v not seen, limit k.....	.....	<22	<12.5	....	....	....
23	29	10	4865.67	150	6	v not seen, limit k.....	.....	<22	<12.5	....	....	....
24	Aug. 10	9	4877.63	150	6	v not seen, limit k.....	.....	<22	<12.5	....	....	....
25	26	9	4893.61	150	6	v not seen, limit k.....	.....	<22	<12.5	....	....	....
26	Sept. 13	8	4911.58	...	6	v not seen, limit 1 < e.....	.....	<22	<12.5	....	....	....
27	25	7	4923.54	...	6	v not seen, limit k.....	.....	<22	<12.5	....	....	....
28	Oct. 2	8	4930.58	200	6	v not seen, limit k.....	.....	<21	<12.6	....	....	....
29	7	7	4935.54	150	6	v not seen, limit 1 < k.....	.....	<22	<12.5	....	....	....
30	21	8	4949.56	200	6	v not seen, limit 1 < e.....	.....	<22	<12.5	....	....	....
31	24	8	4952.56	200	6	v not seen, limit k.....	.....	<22	<12.5	....	....	....
32	Nov. 4	7	4963.54	200	6	v not seen, limit k.....	.....	<22	<12.5	....	....	....
33	20	7	4979.52	150	6	v not seen, limit e.....	.....	<23	<12.4	....	....	....
34	22	7	4981.54	200	6	v not seen, limit 1 < k.....	.....	<21	<12.5	....	....	....
35	26	7	4985.54	200	6	v not seen, limit 1 < k.....	.....	<21	<12.5	....	....	....
36	Dec. 4	7	4993.54	150	6	v not seen, limit k.....	.....	<22	<12.4	....	....	....
37	19	6	5008.50	150	6	v not seen, limit k.....	.....	<22	<12.4	....	....	....
38	23	7	5012.54	200	6	v not seen, limit k.....	.....	<22	<12.4	....	....	....
39	1900 Jan. 1	7	5021.52	150	6	v not seen, limit 1 < k.....	.....	<21	<12.5	....	....	....
40	8	7	5028.54	350	40	v2-3n, v is 2m < e.....	.....	10.5	13.83	moon	423	+0.03
41	20	9	5040.62	350	40	v2n, np, p1g, q6s, s8t, tu..	.....	10.0	13.90	fair	435	-0.41
42	Feb. 4	7	5055.54	350	40	x1-2v, v4-5n, v3p, p1g, q1n	15.6, 12.5, 13.0.....	13.7	13.48	fair	450	+0.58
43	10	7	5061.54	350	40	v3-4x, k4v, v8n.....	20.6, 17.6, 16.0.....	18.0	13.0	good	456	+0.3±
44	22	9	5073.63	350	40	v6-8x, v3k, v1e, d1ov.....	24.1, 24.6, 24.1, 24.6	24.3	12.27	good	468	+0.27
45	25	7	5076.54	80	12	d8v, r3v, v1g, limit 1 < x..	26.6, 27.5, 28.5.....	27.2	11.97	good	471	+0.18
46	26	7	5077.54	150	6	g2v±, limit v.....	25.5.....	25.5	12.1	poor	472	+0.4±
47	Mar. 6	8	5085.58	150	6	d1v, v3r.....	33.6, 34.5.....	34.0	11.15	good	480	+0.03
48	13	8	5092.58	150	6	v3-4d, v4h.....	38.1, 41.0.....	39.5	10.50	fair	487	-0.37
49	19	7	5098.54	150	6	b3-4v, v5d.....	40.6, 39.6.....	40.4	10.39	good	1	-0.28
50	31	8	5110.56	40	6	b3v, v6d.....	41.1, 40.6.....	42.1	10.19	fair	13	-0.42
51	Apr. 29	15	5139.88	40	6	b1-2v, v8d.....	42.6, 42.6.....	40.0	10.44	good	42	-0.45
52	May 20	14	5160.83	150	6	b2-3v, v6-8d.....	41.6, 41.6.....	38.9	10.60	good	63	-0.53
53	June 15	9	5186.63	150	6	b4v, v4h.....	40.1, 41.0.....	34.7	11.08	poor	89	-0.42
54	July 12	13	5213.79	237	40	b6v±, v3d, v4h.....	38.1, 37.6, 41.0.....	29.1	11.72	good	116	-0.24
55						k2v, d1v, v4r.....	35.0, 33.6, 35.5.....					
						c4v, v6e.....	29.1, 29.1.....					

TABLE 105.—8518 Z CASSIOPEIÆ. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
	1900		2410000+									
56	Aug. 6	9	5238.63	150	6	g3-4v, v limit	24.0	24.0	12.30	fair	141	-0.07
57	14	8	5246.58	150	6	g3v, ve, v2k	24.5, 23.1, 23.6	23.7	12.33	good	149	-0.16
58	28	8	5260.58	200	6	e4v, k1v, limit v	19.1, 20.6	19.8	12.80	good	163	+0.05
59	Sept. 6	11	5269.71	237	40	e1v, v3x	22.1, 20.1	21.1	12.65	fair	172	-0.25
60	13	12	5276.75	237	40	e1v, v4x	22.1, 21.1	21.6	12.59	moon	179	-0.42
61	Oct. 4	8	5297.58	237	40	x3v, v4q	14.1, 15.0	14.5	13.38	fair	200	-0.07
62	16	9	5309.63	460	40	k8v, v4n, v3p, v3q, x5-6v	{13.6, 12.0, 13.0...}	12.8	13.59	good	212	-0.12
63	24	12	5317.75	237	40	photometer	{14.0, 11.6...}	...	13.64	poor	220	-0.25
	1901											
64	Feb. 9	9	5425.63	150	6	v not seen, limit e	...	<23	<12.4	fair	...	...
65	Dec. 21	8	5740.58	350	40	ve, v2k, v4-5 x	23.1, 23.6, 21.6	22.7	12.46	moon	151	-0.06
	1902											
66	Jan. 13	..	5763.6	...	24	k5v, x3v, v 5-6 o	16.6, 14.1, 18.7	16.5	13.15	...	174	+0.21
67	Oct. 1	9	6024.63	237	40	g2v, v1-2e	25.5, 24.6	25.0	12.20	poor	435	-1.25±
68	31	10	6054.67	237	40	v3g, v6e±	30.5, 29.1	30.0	11.62	fair	465	-0.48
69	Nov. 7	15	6061.88	237	40	photometer	...	...	11.49	fair	472	-0.21
	1903											
70	Oct. 10	..	6398	67	12	v not seen, limit 2 < k	...	<20	<12.8	...	...	...
	1904											
71	Aug. 4	9	6697.63	150	6	g3v, v2e	24.5, 25.1	24.8	12.22	fair	124	+0.13
72	29	8	6722.56	150	6	g4v, e1v, v2k	23.5, 22.1, 23.6	23.1	12.40	good	149	-0.10
73	Sept. 5	..	6729	40	6	{photometer, v not seen, limit e	...	<23	<12.4	good	...	...
74	11	8	6735.58	67	12	photometer	...	...	12.95	good	162	+0.23
75	Oct. 1	10	6755.67	40	6	{photometer, v not seen, limit e	...	<23	<12.4	good	...	...
76	8	11	6762.71	237	40	x6-8v, k8v, v8p, v6q	10.1, 13.6, 18.0, 16.0	14.4	13.38	good	189	+0.18
77	27	..	6781	...	6	v not seen, limit k	...	<21	<12.6	fine	...	...
78	30	..	6784	...	24	photographs	...	...	13.6	...	211	...
79	Nov. 2	..	6787	...	12	v not seen, limit 2 < k	...	<19	<12.9	fair	...	...
80	6	..	6791	237	40	no-1v, v3-4s	7.5, 9.5	8.5	14.05	fair	218	+0.20
81	14	..	6799	...	24	photographs, vn	...	8	14.1	...	226	+0.09
	1905											
82	Jan. 3	8	6849.56	237	40	m8v, p6v, u not seen	0.0, 4.0	2.0	14.78	fair	276	-0.06
83	3	8	6849.56	237	40	photometer	...	...	15.33	good		
84	24	7	6870.54	237	40	n6-8s, nq, n2p, x6n	...	<6	<14.3	fair	...	...
85	28	7	6874.54	237	40	o3n, nq, n1p, n3-4s	...	<6	<14.3	good	...	...
86	Feb. 9	8	6886.56	275	12	{n glimpsed ? x3n±, limit 4-5 < k	...	<6	<14.3	fair	...	...
87	25	7	6902.52	237	40	x10-12n, o1n, qn, n1p	...	<6	<14.3	good	...	...
88	Apr. 4	16	6940.92	237	40	x8n±, n20, n6s	...	<6	<14.3	good	...	...
89	11	16	6947.92	237	40	q2n, p1n, no, n4s	...	<6	<14.3	fair	...	...
90	30	15	6966.88	237	40	n5v, sv, v1u	3.0, 6.0, 2.5	4.0	14.64	fair	393	0.00
91	May 22	14	6988.83	450	40	v3n, v1q, v2p, v10	11.0, 12.0, 12.0, 10.9	11.5	13.70	fair	415	-0.40
92	June 4	14	7001.83	450	40	v2-3q, v2-3n, v40, x6v	13.5, 10.5, 13.9, 11.1	12.2	13.63	fair	428	-0.02
93	13	14	7010.83	237	40	v4q, v5n, x3v	15.0, 13.0, 14.1	14.0	13.43	good	437	0.00
94	27	14	7024.84	237	40	photometer	...	...	13.35	good	451	+0.55
95	July 23	11	7050.71	237	40	v40, v3q, x6v	13.9, 14.0, 11.1	13.4	13.50	fair	477	+2.10
96	30	12	7057.75	237	40	x3v, v4q	14.1, 15.0	14.5	13.38	good	484	+2.42
97	Aug. 6	9	7064.63	237	40	x3-4v, v5q, v50	13.6, 16.0, 14.9	14.8	13.35	good	491	+2.65
98	19	9	7077.63	237	40	v7-8x, v4-5e, vg, h8-10v	24.6, 27.6, 27.5, 28.0	27.3	11.95	good	12	+1.34
99	22	11	7080.71	237	40	v10-12x, v5e, v2g, h8v	28±, 28.1, 29.5, 29±	28.8	11.78	good	15	+1.15
100	28	9	7086.63	150	6	h1v, d2v, v8g±	36.0, 34.4, 35	35.2	11.00	fair	21	+0.32
101	Sept. 17	8	7106.58	150	6	b6v, v6h, v6d	38.1, 42.0, 42.4	40.8	10.31	fair	41	-0.55
102	Oct. 20	8	7139.56	80	12	v5d, v6h, b6v	38.1, 43.0, 38.1	39.3	10.51	good	74	-0.77
103	Nov. 21	-6	7171.50	150	6	d1v, h1v	32.1, 36.0	34.0	11.12	good	106	-0.65

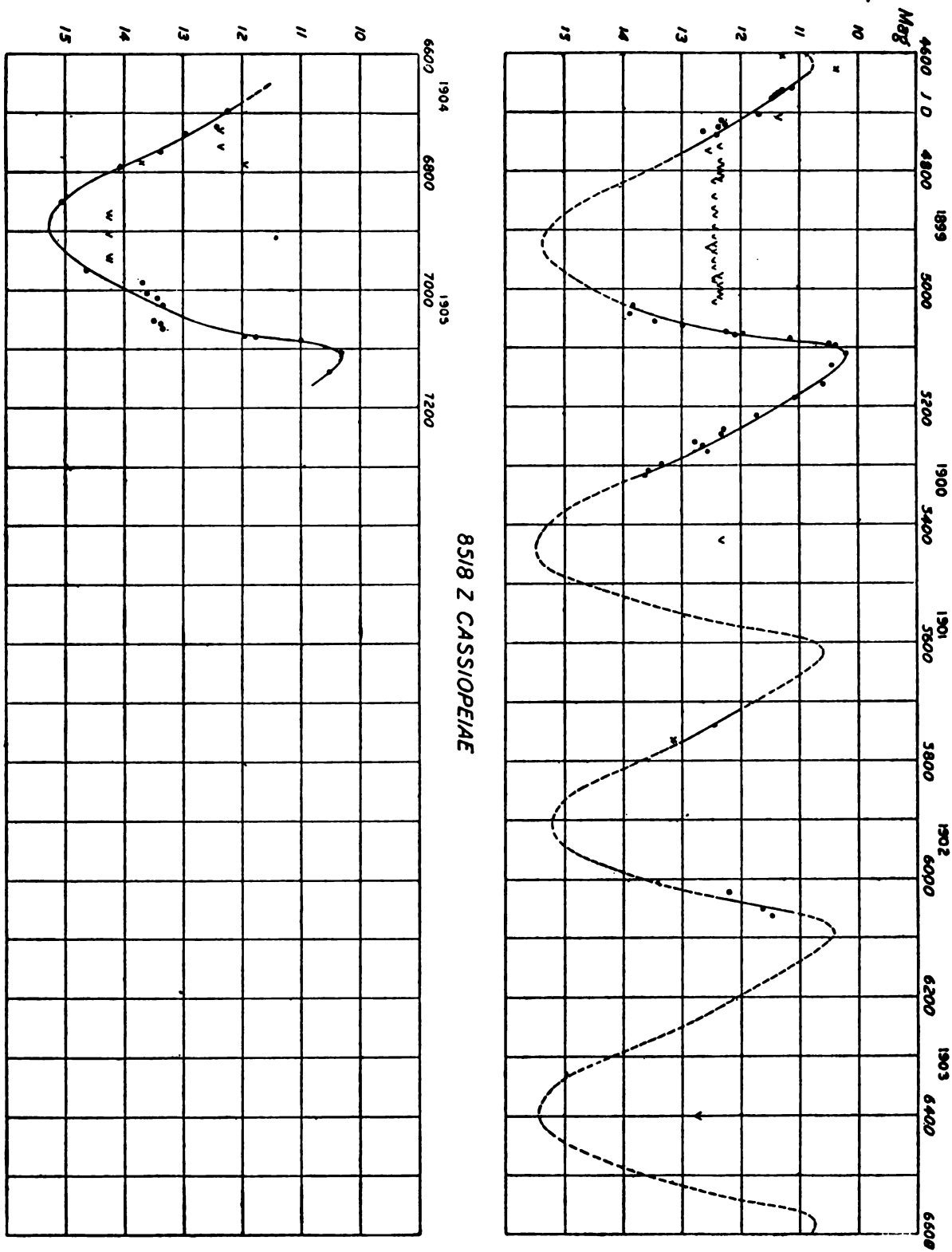


FIG. 35.—LIGHT-CURVE OF Z CASSIOPEIÆ.

TABLE 106.—8518 Z CASSIOPEÆ. MEAN MAGNITUDES FROM 41 DAY GROUPS.

Group No...	1	2	3	4	5	6	7	8	9	10	11	12
J. D.....	41	82	123	164	205	246	287	328	369	410	451	492
4605	<i>t</i>	0	64	107	140	....	....	....	....	....	436	472
	<i>M</i>	11.3±	11.31	12.07	12.52	....	....	....	....	....	13.74	11.83
	ΔM	+0.6±	+0.16	+0.26	+0.2±	....	....	....	....	....	+0.34	+0.14
5097	<i>t</i>	7	52	102	151	184	216	....	....	....	....	....
	<i>M</i>	10.29	10.52	11.40	12.48	12.87	13.62	....	....	....	....	....
	ΔM	-0.35	-0.49	-0.33	-0.06	-0.25	-0.18	....	....	....	....	....
5589	<i>t</i>	....	....	....	151	174	....	....	....	....	435	468
	<i>M</i>	....	....	....	12.46	13.15	....	....	....	....	12.20	11.56
	ΔM	....	....	....	-0.06	+0.21	....	....	....	....	-1.25	-0.34
6573	<i>t</i>	....	....	....	145	189	218	276	....	....	393	433
	<i>M</i>	....	....	....	12.52	13.38	13.95	15.06	....	....	14.64	13.53
	ΔM	....	....	....	+0.09	+0.18	+0.10	+0.06	....	....	0.00	+0.04
Means	<i>t</i>	5	61	106	147	185	217	276	....	....	393	471
	<i>M</i>	10.63	11.08	11.88	12.50	13.03	13.82	15.06	....	....	14.64	13.44
	ΔM	-0.03	-0.02	+0.09	+0.05	-0.05	-0.01	+0.06	....	....	0.00	-0.01
	No.	3	7	7	9	5	5	1	....	....	1	8

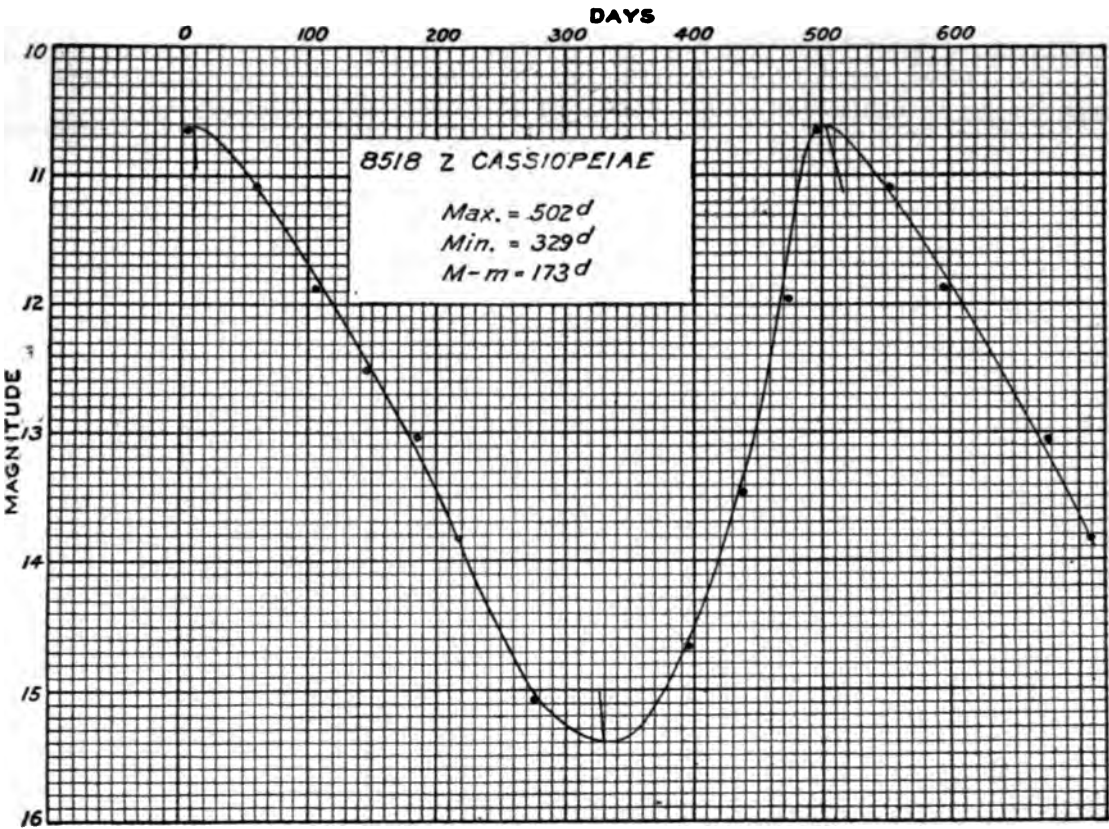


FIG. 36.—MEAN LIGHT-CURVE OF Z CASSIOPEIAE.

TABLE 107.—8518 Z CASSIOPEÆ. OBSERVED MAXIMA AND MINIMA.
Elements of maximum. 1898 Nov. 22 (J. D. 2414617) + 492^d E. $M-m=173^d$.

MAXIMA.							MINIMA.						
Epoch.	Date.		Mag.		Corr.	Wt.	Epoch.	Date.		Mag.		Corr.	Wt.
	Calendar.	J. D.	H.	P.				Calendar.	J. D.	H.	P.		
0	1903 Nov. 27	4622	10.7	10.6	+ 5	9	1	1899 Oct. 9	4937	mc	.....	+ 1	2
1	1900 Apr. 3	5113	10.20	10.09	+ 4	35	2	1901 Feb. 24	5440	mc	.....	- 12	2
2	1901 Aug. 18	5615	mc	.....	+ 14	1	3	1902 June 2	5903	mc	.....	- 17	6
4	1904 Apr. 11	6582	mc	.....	- 3	4	5	1905 Feb. 11	6888	15.18	15.07	- 16	15

The mean light-curve was formed from the observations up to 1905 June 27, and gives the mean period 492 days. The last minimum, 1905 February 16, is the only one well covered by the observations. The five comparisons between 1905 January 24 and April 11 were made with difficulty, owing to the low position of the field and the faintness of the variable, which seems to have been fainter than the star *n*. On account of the difficulties mentioned, the stars *n* and *s* were taken for the variable and *n*, but the real brightness of the variable is shown by the observations of January 3 and April 30. The comparisons made in May, June, and July show an unmistakable halt in the rise between the 13th and 14th magnitude, followed by a sudden increase of more than one magnitude between August 6 and 19. The corresponding rise in February, 1900, was less rapid.

The period 492 days satisfies the present series of observations, and there seem to be no others for comparison until Hartwig's are published.

CHAPTER XIII.

8629 Y CASSIOPEIÆ.

R. A. 23^h 58^m 13^s.8; Dec. +55° 7' 25" (1900).

This variable was discovered by Mrs. Fleming in 1898 at Harvard, from the bright hydrogen lines in its third type spectrum. H. C. O. Circular, No. 24, states that there are 101 plates containing the field, so when these are measured the variation of the star will be thoroughly known. The brighter stars in the field were measured with the 6-inch in February and March, 1898, and the place of the variable relative to the stars *A* and *B* (Cambridge A. G. catalogue) found as given above. The stars *b*, *e*, and *f* were connected with the variable with the micrometer on the 40-inch in February, 1900. The star *e* was found to be double, about 13th and 14th magnitude, position angle 198°, distance 6".6.

Visual comparisons of the variable began in February, 1898, a little too late to definitely fix the maximum, which the mean light-curve aids in placing at March 11, 9.4 magnitude on the Harvard scale. The decline following this maximum was followed with the 6- and 12-inch telescopes, and at the minimum the star remained below the limit of the 6-inch for 91 days, from 1898 September 7 to December 7. The next maximum, 1899 April 8, was well covered with the 6-inch, and the variable was found at minimum with the 40-inch, 1900 January 8 (minimum by mean curve, 1899 December 13). The adopted magnitude at the next maximum would be 9.6 or 10.6, according to the weights given to the discordant observations of June 15 and July 12. The probable course of the variations from October, 1900, to August, 1904, is shown by the broken line in fig. 38, fixed by the aid of the mean light-curve, guided by occasional observations sufficient to give the number of the epoch. From August, 1904, regular comparisons fix the maximum of epoch 6 and the following minimum, and show that the adopted period, 410 days, is substantially correct.

TABLE 108.—8629 Y CASSIOPEIÆ. STANDARD MAGNITUDE STARS.

Star.	B. D. No.	1900.		Color P. DM.	Magnitude.				Residuals.		
		R. A.	Dec.		Catalogue.		Measured.		From Cats.		3 Nights inter se.
					H.C.O.	P. DM.	H.	P.	H.	P.	
<i>C</i>	°	<i>h m s</i>	° '								
<i>F</i>	+54 3109	00 00 30	+55 09.2	G—	7.11	7.05	7.29	7.02	+18	— 3	±4
<i>G</i>	+55 3055	23 51 53	+55 17.0	WG	7.01	6.57	6.88	6.61	—13	+ 4	±6
	+55 3041	23 49 02	+55 56.0	G	7.48	7.16	7.43	7.16	— 5	0	±6
	Mean .....	.....	.....	.....	7.20	6.93	7.20	6.93	±12	± 2	±5

MAGNITUDES OF COMPARISON STARS.

The standard magnitude stars in the two fields in the constellation Cassiopeiæ are distinguished from those in the other ten fields in that they are fainter in the Harvard than in the Potsdam Catalogue. The difference is only -0.11 in the Z Cassiopeiæ field, where it might be partially accounted for by the use of only two stars. But in this field, for three stars, the difference amounts to -0.27 . That this is not accidental, nor entirely due to the star colors, is shown by the standards in two "Rumford" fields, U and S Cassiopeiæ, where the differences are -0.16 and -0.01 , respectively, so that the mean difference for the four fields in this constellation is -0.14 , as compared with $+0.29$ for the other ten fields here considered. If the Harvard scale is adopted for this field the limit of vision of the 6-inch becomes 13.53 from the star α , an abnormally faint limit.

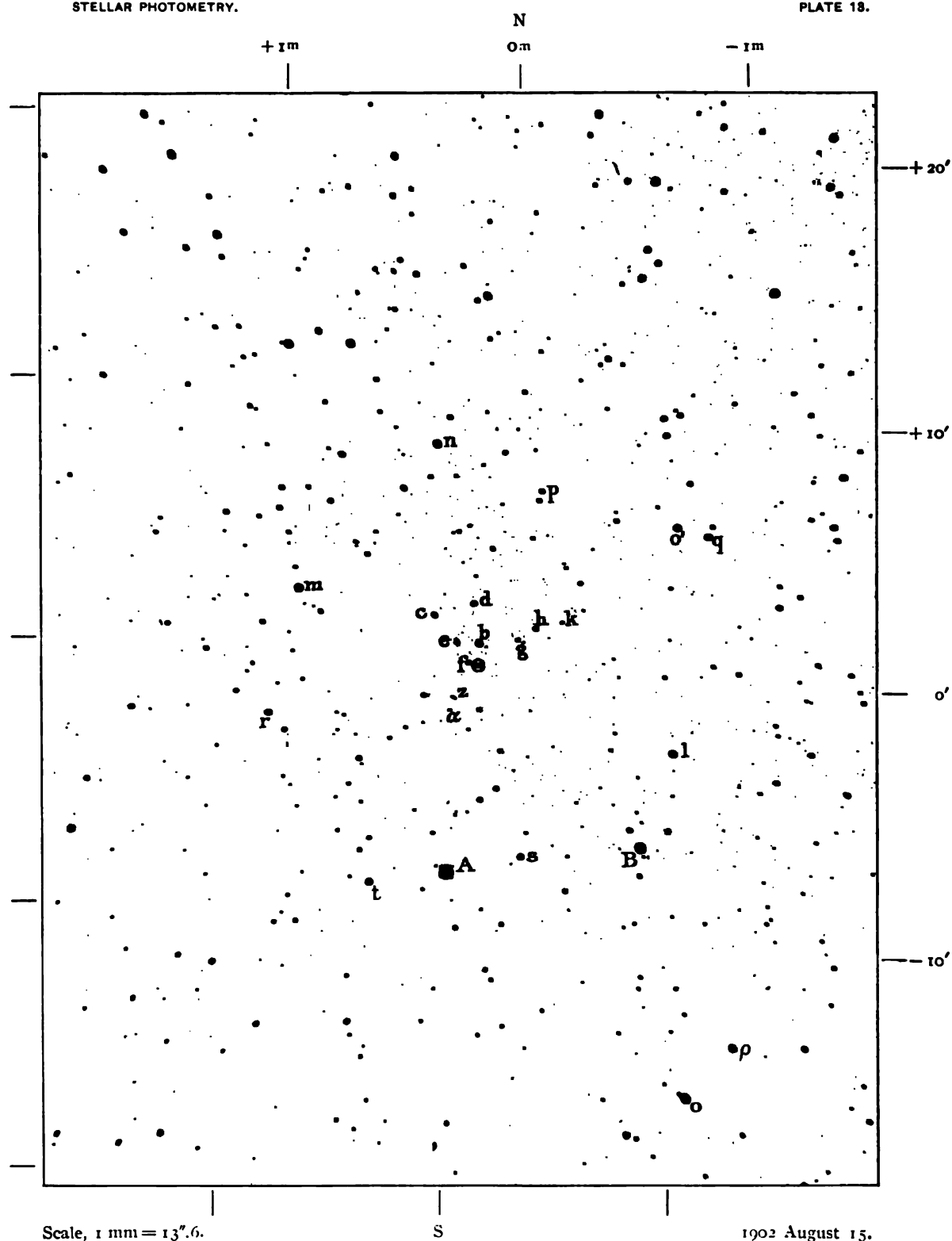
TABLE 109.—8629 Y CASSIOPEIÆ. COMPARISON STARS IN B. D. CATALOGUE.

Star.	B. D.		1855.		Star.	B. D.		1855.	
	No.	Mag.	R. A.	Dec.		No.	Mag.	R. A.	Dec.
	°		<i>h m s</i>	° ′		°		<i>h m s</i>	° ′
<i>ρ</i>	+54 3096	9.5	23 54 45	+54 38.5	<i>ς</i>	+54 3102	9.5	23 55 42	+54 45.6
<i>ο</i>	+54 3098	9.1	23 54 55	+54 36.7	<i>A</i>	+54 3103	7.9	23 56 2	+54 44.9
<i>ι</i>	+54 3099	9.5	23 55 3	+54 48.8	<i>m</i>	+54 3105	9.5	23 56 42	+54 54.0
<i>B</i>	+54 3101	8.3	23 55 13	+54 46.9	<i>β</i>	+55 3078	9.1	23 56 40	+55 13.3

TABLE 110.—COMPARISON STARS FOR Y CASSIOPEIÆ (IN ORDER OF RIGHT ASCENSION).

Star.	Coordinates from Variable.			Light Scale, Steps.	Magnitude.			
	R. A.		Dec.		Measured.		From Curve.	
	H.	P.	H.		H.	P.	H.	P.
ρ'	°	'	°	....	....	....	....	....
σ	-637	-74.3	- 822	27.2	....	....	9.17	8.90
q	-536	-62.5	- 945	....	....	....	....	....
ι	-509	-59.4	+ 328	....	....	....	....	....
σ'	-457	-53.3	- 170	23.2	9.87	9.60	....	....
B	-438	-51.1	+ 343	....	....	....	....	....
k	-397	-46.4	- 387	....	8.35	8.08	....	....
h	-186	-21.7	+ 112	4.4	....	....	13.09	12.82
s	-125	-14.6	+ 92	7.1	....	....	12.60	12.33
p	-122	-14.2	- 426	....	10.10	9.83	....	....
g	-122	-14.2	+ 406	....	....	....	....	....
b	- 87	-10.2	+ 64	6.0	12.82	12.55	....	....
d	+ 1	+ 0.1	+ 50	19.6	10.46	10.19	....	....
f	+19	+ 2.2	+141	10.8	11.43	11.16	....	....
A	+23	+ 2.7	+ 6	7.8	12.13	11.86	....	....
s^*	+49	+ 5.7	- 470	....	7.77	7.50	....	....
e	+51	+ 6.0	- 73	0.0	14.01	13.74	....	....
a	+54	+ 6.3	+ 50	5.9	....	....	12.83	12.56
c	+60	+ 7.0	- 103	2.1	13.53	13.26	....	....
n	+110	+12.8	+111	16.3	10.71	10.44	....	....
t	+128	+14.9	+497	....	....	....	....	....
β	+223	+26.0	- 505	....	....	....	....	....
m	+393	+45.8	+1287	31.8	....	....	8.40	8.13
r	+426	+49.7	+150	25.0	10.02	9.75	....	....
	+479	+55.9	+139	....	....	....	....	....

*The preceding component.



8629 Y CASSIOPEIÆ.

R. A. 23h 58m 13s.8. Dec. +55° 7' 25", 1900.

TABLE III.—8629 Y CASSIOPEÆ. PHOTOMETER MEASURES OF COMPARISON STARS.

1904 October 6.			6-INCH.				Fine.	
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
h m 21 38	° 27	Gas	12.6 12.7 12.1	12.27	12.12	0.52	7.98	7.71
		m	28.8 30.0 30.0	29.60	29.59	2.63	10.09	9.82
		v	34.9 36.1 35.3	35.43	.....	3.40	10.86	10.59
		A	10.2 10.2 10.0	10.13	10.53	0.35	7.81	7.54
		B	15.1 15.0 15.0	15.03	14.85	0.91	8.37	8.10
		l	28.1 28.0 27.9	28.00	27.19	2.36	9.82	9.55
		F'at	10.0 10.0 9.2	13.63	9.42	0.23	7.69	7.42
		Gas	12.9 14.3 13.7	13.63	13.52	0.72	8.18	7.91
		Gas	13.1 13.8 13.3	13.40	.....	.....	.....	.....
		F'at	8.8 9.6 8.9	9.10	.....	.....	.....	.....
		l	26.1 25.8 27.2	26.37	.....	.....	.....	.....
		B	14.3 15.0 14.7	14.67	.....	.....	.....	.....
		A	10.9 11.1 10.8	10.93	.....	.....	.....	.....
		m	29.7 30.0 29.0	29.57	.....	.....	.....	.....
		Gas	12.2 11.7 12.0	11.97	.....	.....	.....	.....
1904 October 15.			Good.					
o 26	16	Gas	16.9 18.4 17.5	17.60	17.20	1.24	8.28	8.01
		G	10.3 11.0 11.2	10.83	.....	0.37	7.41	7.14
		F'at	10.8 11.3 10.2	10.77	11.82	0.49	7.53	7.26
		l	31.7 32.1 32.2	32.00	31.47	2.86	9.90	9.63
		B	17.1 18.1 18.1	17.77	17.97	1.35	8.39	8.12
		s	32.9 33.1 32.7	32.90	.....	3.04	10.08	9.81
		A	13.1 14.0 13.4	13.50	14.02	0.78	7.82	7.55
		m	31.7 32.9 32.4	32.33	32.67	3.02	10.06	9.79
		C	10.0 10.0 9.2	9.73	9.65	0.25	7.29	7.02
		C	10.1 8.9 9.7	9.57	.....	.....	.....	.....
		m	32.0 33.6 33.4	33.00	.....	.....	.....	.....
		v	35.6 36.1 34.7	35.47	.....	3.40	10.44	10.17
		A	15.0 13.9 14.7	14.53	.....	.....	.....	.....
		B	18.3 18.0 18.2	18.17	.....	.....	.....	.....
		l	31.0 30.7 31.1	30.93	.....	.....	.....	.....
F'at	13.4 12.6 12.8	12.87	.....	.....	.....	.....
Gas	17.1 16.4 16.9	16.80	.....	.....	.....	.....
1904 October 27.			Fine.					
21 o	31	Gas	12.7 13.7 13.6	13.33	13.33	0.68	8.09	7.82
		F'at	9.6 8.6 9.2	9.13	9.62	0.25	7.66	7.39
		l	27.5 28.0 27.6	27.70	28.10	2.47	9.88	9.61
		B	13.7 13.9 13.6	13.73	14.52	0.87	8.28	8.01
		s	27.8 28.0 29.0	28.27	.....	2.47	9.88	9.61
		A	9.1 10.4 9.8	9.77	10.05	0.28	7.69	7.42
		v	23.2 24.4 24.0	23.87	.....	2.03	9.44	9.17
		m	28.0 28.2 28.1	28.10	28.52	2.51	9.92	9.65
		Gas	12.9 12.9 13.8	13.20	13.29	0.68	8.09	7.82
		Gas	13.3 14.0 12.8	13.37	.....	.....	.....	.....
		m	29.0 28.5 29.3	28.93	.....	.....	.....	.....
		A	9.6 10.3 11.1	10.33	.....	.....	.....	.....
		B	15.1 15.8 15.0	15.30	.....	.....	.....	.....
		l	28.5 28.1 28.9	28.50	.....	.....	.....	.....
		F'at	10.0 10.1 10.1	10.07	.....	.....	.....	.....
Gas	13.2 13.0 13.8	13.33	.....	.....	.....	.....
21 18	28							

TABLE III.—8629 Y CASSIOPEÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1904 September 2.			12-INCH.				Good.	
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
<i>h m</i> 19 35	44	<i>l</i>	20.0 20.9 21.0	20.63	20.60	1.78	9.84	9.57
		<i>B</i>	5.0 6.7 5.6	5.77	6.32	0.22	8.28	8.01
		<i>B_{at}</i>	14.2 14.4 14.8	14.47	14.57	1.00	9.06	8.79
		<i>A_{at}</i>	10.7 10.1 10.1	10.30	10.00	0.44	8.50	8.23
		<i>v</i>	36.2 36.8 36.9	36.63	.....	3.40	11.46	11.19
		<i>b</i>	27.9 28.0 28.1	28.00	27.62	2.43	10.49	10.22
		<i>d</i>	35.0 35.1 35.0	35.03	35.72	3.27	11.33	11.06
		<i>c</i>	30.0 29.3 30.2	29.83	30.22	2.67	10.73	10.46
		<i>m</i>	22.0 23.1 23.1	22.73	22.98	2.01	10.07	9.80
		<i>m</i>	23.2 22.9 23.6	23.23	.....	.....	.....	.....
		<i>c</i>	31.0 30.9 29.9	30.60	.....	.....	.....	.....
		<i>d</i>	36.6 36.4 36.2	36.40	.....	.....	.....	.....
		<i>b</i>	26.1 28.7 26.9	27.23	.....	.....	.....	.....
		<i>A_{at}</i>	9.0 10.1 10.0	9.70	.....	.....	.....	.....
		<i>B_{at}</i>	14.0 15.1 14.9	14.67	.....	.....	.....	.....
		<i>B</i>	6.7 7.2 6.7	6.87	.....	.....	.....	.....
		<i>l</i>	20.7 20.7 20.3	20.57	.....	.....	.....	.....
19 52	40							
1904 November 2.			Fair, a little dull and unsteady.					
21 2	31	<i>l</i>	25.6 24.4 25.1	25.03	25.87	2.27	9.87	9.60
		<i>B</i>	12.0 12.0 11.8	11.93	12.10	0.69	8.29	8.02
		<i>s</i>	27.8 28.8 28.2	28.27	28.64	2.52	10.12	9.85
		<i>A_{at}</i>	14.9 14.6 15.0	14.83	13.83	0.90	8.50	8.23
		<i>v</i>	19.7 19.7 18.9	19.43	.....	1.64	9.24	8.97
		<i>b</i>	32.3 32.1 32.1	32.17	32.45	2.90	10.50	10.23
		<i>d</i>	42.7 42.5 42.1	42.43	41.70	3.97	11.57	11.30
		<i>c</i>	33.2 33.9 32.9	33.33	33.72	3.05	10.65	10.38
		<i>m</i>	27.3 28.0 27.4	27.57	27.69	2.43	10.03	9.76
		<i>m</i>	27.9 27.8 27.7	27.80	.....	.....	.....	.....
		<i>c</i>	34.8 34.1 33.4	34.10	.....	.....	.....	.....
		<i>d</i>	40.4 40.9 41.6	40.97	.....	.....	.....	.....
		<i>b</i>	32.1 33.3 32.8	32.73	.....	.....	.....	.....
		<i>A_{at}</i>	12.8 12.4 13.3	12.83	.....	.....	.....	.....
		<i>s</i>	29.1 29.2 28.7	29.00	.....	.....	.....	.....
		<i>B</i>	12.1 12.6 12.1	12.27	.....	.....	.....	.....
		<i>l</i>	26.6 27.1 26.1	26.70	.....	.....	.....	.....
21 24	28							
1904 November 3.			Good.					
21 1	30	<i>m</i>	24.9 25.3 25.1	25.10	24.59	2.26	10.22	9.95
		<i>c</i>	31.9 30.9 31.1	31.30	31.39	2.78	10.74	10.47
		<i>d</i>	36.5 37.6 36.7	36.93	37.25	3.44	11.40	11.13
		<i>b</i>	28.0 28.7 27.8	28.17	27.79	2.44	10.40	10.13
		<i>v</i>	16.2 16.6 16.4	16.40	.....	1.24	9.20	8.93
		<i>A_{at}</i>	10.1 10.1 9.2	9.80	9.40	0.37	8.33	8.06
		<i>s</i>	24.5 24.9 24.3	24.57	24.15	2.12	10.08	9.81
		<i>B</i>	8.2 7.9 6.9	7.63	7.52	0.21	8.17	7.90
		<i>l</i>	23.2 22.8 23.2	23.07	22.94	2.01	9.97	9.80
		<i>l</i>	22.7 23.3 22.4	22.80	.....	.....	.....	.....
		<i>B</i>	7.8 7.1 7.3	7.40	.....	.....	.....	.....
		<i>s</i>	23.0 24.1 24.2	23.77	.....	.....	.....	.....
		<i>A_{at}</i>	8.2 9.8 9.0	9.00	.....	.....	.....	.....
		<i>b</i>	27.5 27.0 27.7	27.40	.....	.....	.....	.....
		<i>d</i>	38.0 37.4 37.3	37.57	.....	.....	.....	.....
		<i>c</i>	31.2 31.2 32.1	31.47	.....	.....	.....	.....
		<i>m</i>	24.2 24.0 24.0	24.07	.....	.....	.....	.....
21 20	28							

TABLE 111.—8629 Y CASSIOPEÆ. PHOTOMETER MEASURES OF COMPARISON STARS.—Continued.

1902 December 26.			40-INCH.				Clear, unsteady.	
Sidereal Time.	Zen. Dist.	Star.	Scale Readings.	Mean Scale Readings.		C.	Magnitude.	
				Mean of 3.	Mean of 6.		H.	P.
h m 4 25	°	c	16.9 18.5 17.9	17.77	18.39	1.49	10.84	10.57
		d	25.0 24.3 25.0	24.77	25.47	2.24	11.59	11.32
		b	12.8 12.9 13.4	13.03	13.30	0.82	10.17	9.90
		v	30.7 30.1 31.0	30.60	.....	2.71	12.06	11.79
		f	30.8 32.1 31.9	31.60	31.04	2.76	12.11	11.85
		a	44.8 43.8 43.7	44.10	44.27	4.25	13.60	13.33
		a	44.7 44.4 44.2	44.43	.....	.....	.....	.....
		f	29.8 30.7 30.9	30.47	.....	.....	.....	.....
		b	14.3 12.6 13.8	13.57	.....	.....	.....	.....
		d	25.8 26.4 26.3	26.17	.....	.....	.....	.....
		c	19.2 18.5 19.3	19.00	.....	.....	.....	.....
		1905 January 7.			Clear, unsteady.			
4 6	42	c	14.0 14.9 15.3	14.73	14.92	1.04	10.75	10.48
		d	21.9 21.8 22.2	21.97	22.87	2.06	11.77	11.50
		b	7.2 8.6 9.1	8.30	9.24	0.37	10.08	9.81
		f	26.2 29.3 28.7	28.07	28.35	2.50	12.21	11.94
		a	36.3 37.1 37.7	37.03	37.33	3.47	13.18	12.91
		a	37.3 37.5 38.1	37.63	.....	.....	.....	.....
		v	16.1 16.0 14.8	15.63	.....	1.15	10.86	10.59
		f	28.3 28.6 29.0	28.63	.....	.....	.....	.....
		b	11.0 9.2 10.3	10.17	.....	.....	.....	.....
		d	24.6 22.2 24.5	23.77	.....	.....	.....	.....
		c	13.9 16.3 16.1	15.10	.....	.....	.....	.....
		1905 January 28.			Good.			
4 10		c	13.2 13.8 12.8	13.93	13.32	0.83	10.78	10.51
		d	20.3 20.3 21.1	20.57	20.04	1.72	11.67	11.40
		b	4.8 7.9 8.3	7.00	7.40	0.20	10.15	9.88
		v	9.2 8.1 8.2	8.50	8.20	0.26	10.21	9.94
		f	22.8 25.7 24.9	24.47	24.52	2.17	12.12	11.85
		a	38.3 37.2 37.3	37.60	37.02	3.44	13.39	13.12
		a	36.4 36.9 36.0	36.43	.....	.....	.....	.....
		f	25.2 24.4 24.1	24.57	.....	.....	.....	.....
		v	7.4 8.2 8.1	7.90	.....	.....	.....	.....
		b	7.3 7.8 8.3	7.80	.....	.....	.....	.....
		d	18.8 20.2 19.5	19.50	.....	.....	.....	.....
		c	12.1 13.7 12.3	12.70	.....	.....	.....	.....
4 20	44	g	24.1 23.7 24.0	23.93	.....	2.20	12.15	11.88
1900 July 12.			WEDGE II.				Fair, moon.	
22 20		b	13.2 15.5 13.0 } 11.8 11.8 }	13.06	.....	0.42	10.06	9.79
		f	24.0 25.8 28.0 } 27.0 }	26.20	26.36	2.44	12.08	11.81
		d	24.7 26.0 25.1 } 24.4 }	25.05	.....	2.26	11.90	11.63
		c	17.0 16.1 16.4 } 18.0 }	16.88	.....	1.00	10.64	10.37
		g	34.0 32.4 33.0 } 32.3 }	32.93	.....	3.19	12.83	12.56
		x	43.5 }	43.5	.....	4.32	13.96	13.69
		a	43.7 45.0 43.7 } 42.4 }	43.20	.....	4.30	13.94	13.67
		f	24.0 27.7 29.2 } 25.2 }	26.53	.....	.....	.....	.....
		v	15.9 15.2 }	15.55	.....	0.77	10.41	10.14

TABLE 112.—8629 Y CASSIOPEÆ. CONSTANTS FOR REDUCTION AND COMPARISON WITH CATALOGUE MAGNITUDES.

6-INCH.															
Star.	1904 October 6.					1904 October 15.					1904 October 27.				
	C.	Obs. Mag.		Δ Mag.		C.	Obs. Mag.		Δ Mag.		C.	Obs. Mag.		Δ Mag.	
		H.	P.	H.	P.		H.	P.	H.	P.		H.	P.	H.	P.
C.....	-0.23	7.23	6.96	+ .12	-.09	0.25	7.29	7.02	+ .18	-.03	-0.07	7.34	7.07	+ .23	+.02
F'.....	-0.52	6.94	6.67	-.07	+ .10	-0.26	6.78	6.51	-.23	-.06	-0.50	6.91	6.64	-.10	+.07
G.....	-0.03	7.43	7.16	-.05	.00	0.49	7.53	7.26	+ .05	+.10	-0.07	7.34	7.07	-.14	-.09
Means.	-0.26	7.20	6.93	± .08	± .06	0.16	7.20	6.93	± .15	± .06	-0.21	7.20	6.93	± .16	± .06
M ₀.....	....	7.46	7.19	...	...	....	7.04	6.77	...	...	....	7.41	7.14	...	...

12-INCH.					40-INCH.					
Star.	Mag. 6-inch.	C.			Star.	Mag. 12-inch.	C.			
		Sept. 2.	Nov. 2.	Nov. 3.			Dec. 26.	Jan. 7.	July 12.	Jan. 28.
A.....	7.77	-0.40	0.06	-0.47	b.....	10.46	0.82	0.37	0.42	0.20
B.....	8.35	0.22	0.69	0.21	c.....	10.71	1.49	1.04	1.00	0.83
l.....	9.87	1.78	2.27	2.01	d.....	11.43	2.24	2.06	2.26	1.72
m.....	10.02	2.01	2.43	2.26						
Mean C....	....	0.90	1.36	1.21	Mean C....	....	1.52	1.16	1.23	0.92
Mean Mag..	8.96	8.96	8.96	8.96	Mean Mag..	10.87	10.87	10.87	10.87	10.87
M ₀.....	....	8.06	7.60	7.96	M ₀.....	....	9.35	9.71	9.64	9.95

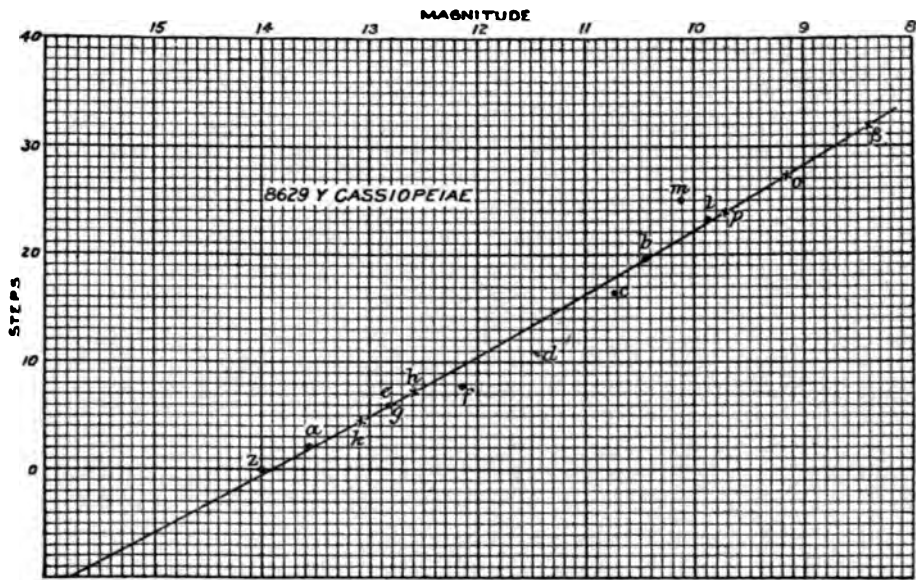


FIG. 37.—MAGNITUDE-CURVE FOR Y CASSIOPEÆ.

TABLE 114.—8629 Y CASSIOPEÆ. VISUAL OBSERVATIONS OF THE VARIABLE.

No.	Date.			Ocular.	Aperture.	Comparisons.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C.S.T.	Julian Day G. M. T.					Steps.	Mag.			
1	1898 Feb. 15	8	2410000+ 4336.58	150	6	{v2b, b2c, c4d, d3h, h1-2g.} {g1k, d3e, e1-2f. } {v2b, b1c, c6d, d5f, f2e. } {d2h, h1g, g2k, g2f. .... }	.....	21.6	10.07	....	0	+0.32
2	23	7	4344.54	150	6		.....	21.6	10.07	good	8	+0.37
3	24	7	4345.54	...	6	v4b, v2l, v1-2m, o2v, v1p.	{23.6, 25.2, 26.5...} {25.2, 24.9. }	25.0	9.50	....	9	-0.20
4	Mar. 4	7	4353.54	{150 40 80	6 6 6	v2-3l, m0-1v, v3-4b. ov, v2p, v2-3l, D2-3v. v2l, v1-2m, ov, v4b.	{25.7, 24.5, 23.1...} {27.2, 25.9, 25.7...} {25.2, 26.5, 27.2, 23.6	24.3	9.61	good	17	-0.12
5	5	7	4354.54	150	6	v2l, v3b, m1v.	25.2, 22.6, 24.0.	25.6	9.43	fair	18	-0.31
6	13	7	4362.54	150	6	o1v, v2m, v3l.	23.6, 24.0, 26.2.	23.9	9.70	good	26	-0.13
7	16	7	4365.54	40	6	v4b, m1v, v3l.	26.2, 27.0, 26.2.	25.5	9.43	good	29	-0.46
8	23	7	4372.54	150	6	v3l, vm, v4b.	23.6, 24.0, 26.2.	24.9	9.53	good	36	-0.45
9	28	7	4377.54	40 150	6 6	o4v, v1p, v2m. v0-1m, v2b.	{23.2, 24.9, 27.0...} {25.5, 21.6. }	24.4	9.60	good	41	-0.50
10	Apr. 6	7	4386.54	40 150	6 6	m3v, l2v. m3v, l1-2v, v1-2b.	{22.0, 21.2. } {22.0, 21.7, 21.1. }	21.6	10.07	fair	50	-0.20
11	20	8	4400.58	150	6	m2-3v, l2-3v, vb.	22.5, 20.7, 19.6.	20.9	10.19	fair	64	-0.44
12	25	9	4405.60	150	6	b2-3v, v3-4c.	17.1, 19.8.	18.4	10.61	fair	69	-0.16
13	June 21	13	4462.79	80	12	c3v, do-1v, v3f.	13.6, 10.3, 10.8.	11.5	11.80	good	126	-0.62
14	July 6	11	4477.71	275 ...	12 8	fo-1v, v2e. f2v, ev, v1g, v3z.	{7.3, 7.9. } {5.8, 5.9, 7.0, 3.0. }	6.1	12.79	good	141	+0.08
15	Aug. 1	11	4503.71	175	12	e1-2v, g2v, limit v.	6.4, 4.0.	5.2	12.95	moon	167	-0.16
16	9	9	4511.63	175	12	e2v, v3-4z.	3.9, 3.5.	3.7	13.14	good	175	-0.07
17	18	10	4520.67	275	12	e2v, v3a, v2a.	3.9, 3.0, 4.1.	3.6	13.15	good	184	-0.18
18	Sept. 7	9	4540.63	150	6	f6v, g4v, v1z, limit z.	1.8, 2.0, 1.0.	1.6	13.60	good	204	+0.10
19	Oct. 5	8	4568.58	150	6	v not seen, limit z.		< 0	< 13.9	good	...	...
20	Nov. 5	7	4599.54	150	6	v not seen, limit z and a.		< 1	< 13.7	good	...	...
21	19	7	4613.54	200	6	v not seen, limit z.		< 0	< 13.9	good	...	...
22	30	7	4624.52	150	6	v not seen, limit z.		< 0	< 13.9	good	...	...
23	Dec. 7	7	4631.54	200	6	v glimpsed, v1a.		3.1	13.33	good	295	-0.34
24	10	6	4634.50	200	6	v glimpsed, va.		2.1	13.50	good	298	-0.15
25	26	8	4650.58	200	6	v not seen. ....		...	...	...	...	...
26	30	7	4654.54	200	6	v2a.		4.1	13.16	good	318	-0.25
27	1899 Jan. 6	7	4661.52	200	6	v3-4z, e1-2v.	3.5, 4.4.	3.9	13.19	good	325	-0.10
28	14	7	4669.54	200	6	v4z, e1v.	4.0, 4.9.	4.4	13.08	good	333	-0.02
29	27	6	4682.50	150	6	v4a, v0-1e, g2v.	6.1, 6.4, 4.0.	5.5	12.90	good	346	+0.15
30	Feb. 7	7	4693.54	200	6	v3e, f3-4v, v1g.	8.9, 4.3, 7.0.	6.7	12.70	good	357	+0.40
31	28	8	4714.58	150	6	v2d, v4f, c5v, v8g, d3f.	12.8, 11.8, 11.3, 14.0	12.4	11.67	good	378	+0.67
32	Mar. 7	7	4721.54	150	6	b1v, v1c, v10-12d.	18.6, 17.3, 21.8.	19.2	10.47	fair	385	+0.07
33	13	8	4727.58	150	6	v1-2b, m2v.	21.1, 23.0.	22.0	10.00	fair	391	-0.19
34	28	8	4732.56	40	6	v3-4m, v3-4l, v10.	28.5, 26.7, 27.2.	27.6	9.09	good	396	-0.88
35	Apr. 4	8	4749.58	40	6	o1-2v, v3l, v3m.	25.7, 26.2, 28.0.	26.6	9.26	good	3	-0.47
36	16	16	4761.92	40	6	β6v, o1v, v3m, v3l.	25.8, 26.2, 28.0, 26.2	26.5	9.27	fair	16	-0.46
37	May 1	16	4776.92	40	6	v2m, v2l, v0, v2p, β5v.	{27.0, 25.2, 27.2...} {25.9, 26.8. }	26.4	9.29	fair	30	-0.61
38	21	14	4796.83	150	6	l5v, m6v, v1b.	18.2, 19.0, 20.6.	19.2	10.47	good	50	+0.18
39	29	10	4804.67	150	6	l6v, b3v, v1-2c.	17.2, 16.6, 14.8.	16.2	10.97	fair	58	+0.51
40	June 7	10	4813.67	150	6	b3v, co-1v, v4d.	16.6, 15.8, 14.8.	15.4	11.12	fair	67	+0.41
41	15	10	4821.65	150	6	c3-4v, v1-2d.	12.8, 12.3.	12.5	11.63	low	75	+0.63
42	July 5	10	4841.65	150	6	d1v, vf, v4e.	9.8, 7.8, 9.9.	8.8	12.31	good	95	+0.64
43	11	10	4847.65	150	6	d2-3v, v1f.	8.3, 8.8.	8.5	12.35	poor	101	+0.53
44	17	10	4853.65	150	6	f1v±.		6.8	12.68	moon	107	+0.71
45	Aug. 6	9	4873.63	150	6	e1v, limit 2 < v.		4.9	13.02	fair	127	+0.59
46	26	9	4893.60	150	6	v glimpsed, e2-3v.		3.4	13.28	fair	147	+0.46
47	Sept. 13	8	4911.56	150	6	v glimpsed, e1-2v.		4.4	13.10	moon	165	0.00
48	26	7	4924.54	...	6	v not seen, limit 2 < e.		< 4	< 13.2	good	...	...
49	Oct. 2	8	4930.58	200	6	v not seen, limit a.		< 2	< 13.5	good	...	...
50	Nov. 6	7	4965.54	200	6	v not seen, limit a.		< 2	< 13.5	good	...	...
51	20	7	4979.54	150	6	v not seen, limit e.		< 6	< 12.8	good	...	...
52	27	7	4986.54	200	6	v not seen, limit a.		< 2	< 13.5	fine	...	...
53	Dec. 6	7	4995.54	...	6	v not seen, limit 2 < e.		< 4	< 13.2	good	...	...

TABLE 114.—8629 Y CASSIOPEÆ. VISUAL OBSERVATIONS OF THE VARIABLE.—Continued.

No.	Date.			Ocular.	Aperture.	Comparison.	Reduction, Steps.	Means.		Seeing.	t.	Δ Mag.
	Month and Day.	Hour C. S. T.	Julian Day G. M. T.					Steps.	Mag.			
54	1900 Jan. 8	10	2410000+									
			5028.67	350	40	v not seen, limit 2 < f...						
			5028.68	350	40	e is double, 13 and 13½, 5"						
			5028.68	350	40	a3-4z, 2zv...		-2.0	14.18	fair	282	+0.45
55	24	7	5044.54	150	6	v not seen, a glimpsed...			<13.6			
56	Feb. 9	11	5060.71	275	12	v not seen, limit a...			<13.6	moon		
57	10	7	5061.54	350	40	g5v, a2-3v, v2-3z...	1.0, -0.4, 2.5...	1.0	13.70		315	+0.25
58	19	8	5070.56	150	6	v not seen, limit e...		<6	<12.8			
59	25	8	5076.56	175	12	21v, v1a, limit a...	-1.0, 3.1...	1.0	13.70	good	330	+0.50
60	Mar. 19	8	5098.56	150	6	v glimpsed, e4v±...		1.9	13.55		350	+1.10
61	21	8	5100.58	275	12	v2a, v2z, g3v, e4v...	4.1, 2.0, 3.0, 1.9...	2.7	13.40	good	354	+1.03
62	Apr. 4	8	5114.58	275	12	e3-4v, v1g, v4-5a...	2.4, 7.0, 6.6...	5.0	12.98	good	368	+1.23
63	May 1	15	5141.88	130	12	c1-2v, v4d...	14.8, 14.8...					
				275	12	v8-10e, f2-3e...	14.9...	14.8	11.23	fair	396	+1.22
64	20	14	5160.83	150	6	b2-3v, v2-3c...	17.1, 18.1...	17.9	10.71	moon	4	+0.99
65	June 15	10	5186.65	150	6	a3v, v6, v3d...	15.0, 16.3, 13.8...	15.0	11.03	fair	30	+1.13
66	July 12	15	5213.85	237	40	photometer...			10.41		57	-0.04
67	Aug. 14	9	5246.60	150	6	l2-3b, b4-5c, d2v, v2f...	8.8, 9.8...	9.3	12.22	fair	90	+0.53
68	28	9	5260.60	200	6	d2v, v2f...	8.8, 9.8...	9.3	12.22	good	104	+0.25
69	Oct. 16	10	5309.67	460	40	f2v, v2e...	5.8, 7.9...	6.8	12.68	good	153	-0.28
70	25	7	5318.54	67	12	g4v, v1z...	2.0, 1.0...	1.5	13.72	good	162	+0.65
71	Nov. 26	7	5350.54	40	6	v not held, limit g...		<6	<12.8			
72	Feb. 10	7	5426.54	150	6	v not seen, limit f...		<8	<12.4			
73	Dec. 21	8	5740.58	350	40	v f...		7.8	12.47	good	174	-0.74
74	Aug. 15	..	5977.	..	24	photograph...			12.0			
75	Oct. 1	9	6024.62	237	40	b4v, v1c...	15.6, 17.3...	16.4	10.95	fair	48	+0.74
76	30	7	6053.54	67	12	photometer...			11.26	good	77	+0.25
77	Dec. 26	10	6110.67	237	40	photometer...			12.06	fair	134	-0.54
78	Oct. 10	8	6398.58	67	12	v40, v7-8b...	31.2, 27.1...	29.8	8.73	good	12	-0.97
79	Dec. 6	6	6455.50	40	6	b4v, c2v, v4d...	15.6, 14.3, 14.8...	14.9	11.22	good	69	+0.49
80	Aug. 4	9	6697.63	150	6	d3v, v2e...	7.8, 7.9...	7.8	12.47	fair	311	-0.83
81	29	8	6722.58	150	6	f1v, v2e...	6.8, 7.9...	7.4	12.55	good	336	-0.52
82	Sept. 2	9	6726.63	67	12	photometer...			11.46	good	340	-1.45
83	Oct. 6	9	6760.63	40	6	photometer...			10.86	fine	374	-0.34
84	Nov. 3	..	6788	..	24	photographs...						
85	29	7	6814.54	40	6	vl, vm...	23.2, 25.0...	24.1	9.66	good	18	-0.06
86	Jan. 7	9	6853.63	237	40	photometer...			10.02	fair	45	-0.48
87	28	8	6874.58	237	40	photometer...			10.21	good	78	-0.82
88	Feb. 9	8	6886.56	67	12	b6v, v1c, v5d...	13.6, 17.3, 15.8...					
				275	12	b5v, c1v, v5d...	14.6, 15.3, 15.8...	15.4	11.12	fair	90	-0.38
89	Mar. 3	7	6908.54	67	12	c4v, v1d...	12.3, 11.8...					
				275	12	c5v, v2d...	11.3, 12.8...	12.0	11.73	fair	112	-0.39
90	24	8	6929.58	150	6	d1v, v f±...	9.8, 7.8...	8.8	12.20	low	133	-0.39
91	May 22	14	6988.83	250	40	f8v, v8a...	-0.2, 10.1...	5	13.0	fair	192	-0.4±
92	June 4	15	7001.88	450	40	va±...		2	13.5	poor	205	0.0±
93	26	12	7023.73	300	12	a3v±...		-1	14.1	fair	227	+0.4±
94	27	15	7024.88	237	40	a2v...		0.1	13.89	good	228	+0.23
95	July 30	12	7057.75	237	40	f8-10v, v1a...	(-1.2), 3.1...	3.0	13.36	good	261	-0.40
96	Aug. 6	9	7064.63	237	40	f8-10v, va...	(-1.2), 2.1...	2.0	13.52	good	268	-0.24
97	22	11	7080.71	237	40	f6-7v, v3a...	1.3, 4.1...	3.4	13.28	good	284	-0.44
98	28	9	7086.63	150	6	z, a and v glimpsed...		1	13.7	fair	290	0.0
99	Sept. 2	11	7091.71	237	40	f5-6v, v4-5a...	2.3, 6.6...	4.5	13.07	good	295	-0.60
100	17	8	7106.58	150	6	v not seen, limit e...		<6	<12.8	dull		
101	19	11	7108.71	237	40	v1f, f8a±...	8.8, 10...	8.8	12.31	good	312	-1.17
102	Oct. 20	8	7139.56	80	12	f5v, v1e...	3.8, 6.9...	6.4	12.72	good	343	-0.15
103	22	7	7141.54	237	40	f4-5v, v6a±...	3.3, 8.1...	4.9	13.01	poor	345	+0.22
104	31	12	7150.75	237	40	v3f, d1v...	10.8, 9.8...	10.3	12.03	good	354	-0.37
105	Nov. 21	6	7171.50	150	6	c5v, v1d, v3-4f...	11.3, 11.8, 11.3...	11.6	11.81	good	375	+0.71

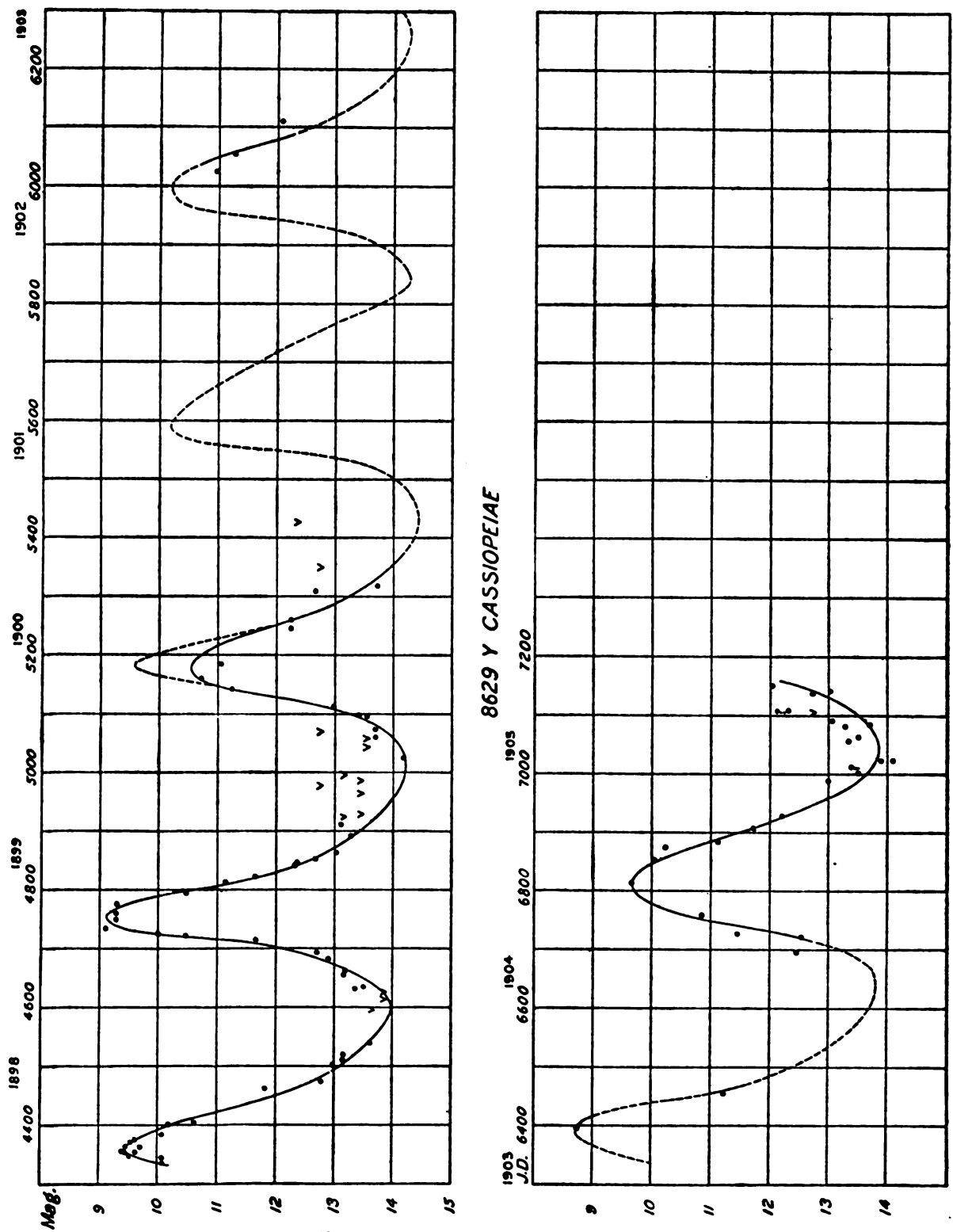


FIG. 38.—LIGHT-CURVE OF Y CASSIOPEIAE.

TABLE 115.—8629 Y CASSIOPEÆ. MEAN MAGNITUDES FROM 34½ DAY GROUPS.

Group No	1	2	3	4	5	6	7	8	9	10	11	12	
J. D.	34	68	102	137	171	205	239	273	308	342	376	410	
4336 {	<i>t</i>	15	48	69	126	154	188	....	....	296	325	352	380
	<i>M</i>	9.69	9.85	10.61	11.80	12.87	13.30	....	....	13.41	13.14	12.80	10.31
	<i>ΔM</i>	-0.06	-0.40	-0.16	-0.62	-0.04	-0.05	....	....	-0.24	-0.12	+0.28	-0.09
	No.	7	4	1	1	2	3	....	....	2	3	2	4
4746 {	<i>t</i>	16	58	90	117	156	....	....	....	282	322	358	396
	<i>M</i>	9.27	10.85	12.10	12.85	13.19	....	....	....	14.18	13.70	13.31	11.23
	<i>ΔM</i>	-0.51	+0.37	+0.60	+0.64	+0.23	....	....	....	+0.45	+0.38	+1.12	+1.22
	No.	3	3	3	2	2	....	....	....	1	2	3	1
5156 {	<i>t</i>	17	57	97	....	158	....	....	....	....	....	....	....
	<i>M</i>	10.87	10.41	12.22	....	13.20	....	....	....	....	....	....	....
	<i>ΔM</i>	+1.06	-0.04	+0.39	....	+0.18	....	....	....	....	....	....	....
	No.	2	1	2	....	2	....	....	....	....	....	....	....
5566 {	<i>t</i>	....	....	....	....	174	....	....	....	....	....	....	....
	<i>M</i>	....	....	....	....	12.47	....	....	....	....	....	....	....
	<i>ΔM</i>	....	....	....	....	-0.74	....	....	....	....	....	....	....
	No.	....	....	....	....	1	....	....	....	....	....	....	....
5976 {	<i>t</i>	....	48	77	134	....	....	....	....	....	....	....	....
	<i>M</i>	....	10.95	11.26	12.06	....	....	....	....	....	....	....	....
	<i>ΔM</i>	....	+0.74	+0.25	-0.54	....	....	....	....	....	....	....	....
	No.	....	1	1	1	....	....	....	....	....	....	....	....
6386 {	<i>t</i>	12	....	69	....	....	....	....	....	329	374	....	....
	<i>M</i>	8.73	....	11.12	....	....	....	....	....	12.16	10.86	....	....
	<i>ΔM</i>	-0.97	....	+0.49	....	....	....	....	....	-1.03	-0.77	....	....
	No.	1	....	1	....	....	....	....	....	3	1	....	....
6796 {	<i>t</i>	18	57	84	112	....	....	....	....	....	....	....	....
	<i>M</i>	9.66	10.02	10.66	11.73	....	....	....	....	....	....	....	....
	<i>ΔM</i>	-0.06	-0.39	-0.60	-0.39	....	....	....	....	....	....	....	....
	No.	1	1	2	1	....	....	....	....	....	....	....	....
Means {	<i>t</i>	16	53	85	121	159	188	....	....	291	325	354	383
	<i>M</i>	9.70	10.33	11.46	12.26	13.00	13.30	....	....	13.67	12.91	12.90	10.50
	<i>ΔM</i>	-0.06	-0.02	+0.12	-0.05	-0.11	-0.05	....	....	-0.01	-0.34	+0.52	+0.17
	No.	14	10	11	5	7	3	....	....	3	8	6	5

TABLE 116.—8629 Y CASSIOPEÆ. OBSERVED MAXIMA AND MINIMA.
Elements of maximum. 1898 March 5 (J. D. 2414354)+410^d E. *M* - *m*=158^d.

MAXIMA.							MINIMA.						
Epoch.	Date.		Mag.		Corr.	Wt.	Epoch.	Date.		Mag.		Corr.	Wt.
	Calendar.	J. D.	H.	P.				Calendar.	J. D.	H.	P.		
0	1898 Mar. 11	4360	9.41	9.14	+ 6	7	1	1898 Nov. 4	4598	14.0	13.7	- 8	17
1	1899 Apr. 8	4753	9.10	8.83	-11	11	2	1899 Dec. 13	5012	14.2	13.9	- 4	19
2	1900 June 9	5180	10.57	10.30	+ 6	7	3	1901 Feb. 16	5432	....	mc	+ 6	4
3	1901 July 24	5590	....	mc	+ 6	1	4	1902 Mar. 31	5840	....	mc	+ 2	1
4	1902 Sept. 7	6000	....	mc	+ 6	2	5	1903 May 15	6250	....	mc	+ 4	2
5	1903 Oct. 10	6398	8.70	8.43	- 6	2	6	1904 June 8	6640	....	mc	-16	3
6	1904 Nov. 27	6812	9.63	9.36	- 2	9							

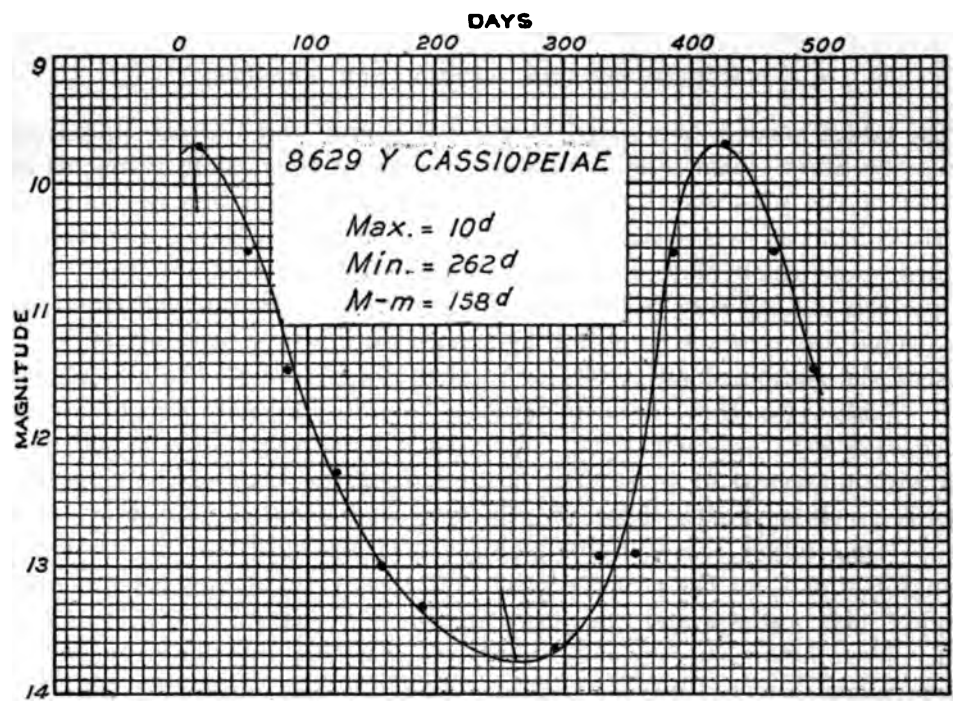


FIG. 39.—MEAN LIGHT-CURVE OF Y CASSIOPEIAE.

CHAPTER XIV.

GENERAL CONCLUSIONS.

I. PRECISION OF THE PHOTOMETER MEASURES.

The tables headed "Standard Magnitude Stars" and "Mean Magnitudes of Comparison Stars" furnish data for some important conclusions in regard to the precision of the photometric work. The method of reduction of the measures with the 6-inch, as explained on page 16, gives magnitude values for each of the standard stars which must average the same as the catalogue values. If both were perfect, the separate residuals between the catalogue and measured magnitudes would be zero. Except for systematic differences, the actual residuals represent the combined effect of the accidental errors of the two systems compared. Table 117 collects the mean values of these residuals for the three standard stars in each field for each night, expressed in hundredths of a magnitude and taken without regard to sign. The mean residual for each of the three or four nights is given separately from the Harvard and from the Potsdam catalogue values. Then follow two columns giving the means of all the nights under the headings H and P for the two systems. The next two columns give the number of nights' observations and the mean residuals of my measures among themselves. Then follow the Potsdam colors, W standing for white, G for yellow, GW for yellowish white, WG for whitish yellow, the plus and minus signs indicating a greater or less degree of color.

Before these results are discussed, it is necessary to find if there is a systematic difference, due to color, between my measures and the two catalogues. The standard stars and their residuals were arranged according to color, and means taken of five groups each containing at least four stars, 28 stars in all. It was found that I see white stars fainter and yellow stars brighter than the catalogues, the range between white and whitish yellow stars being 0.20 as compared with the Harvard and 0.07 as compared with the Potsdam values. Correcting the 28 stars for the color effect, the mean residual was reduced from 0.12 to 0.11 for the Harvard system, but remained at 0.06 for the Potsdam system, an effect so slight that it may be disregarded in the discussion.

The results of Table 117 can now be discussed.

(1) *Considering the agreement of my measures among themselves.*—The average difference between a single night's magnitude of a star and the mean of the three (or in one case four) nights, ranges from 0.02 to 0.07 when the means for the three stars in the field are considered. The residuals for the separate stars range from 0.01 to 0.11; the general average of the residuals is ± 0.04 , corresponding to a probable error in the mean of a little less than 0.03 magnitude. The extreme values of the probable error are ± 0.01 and ± 0.05 for the separate stars.

For comparison, in the three parts of the Potsdam catalogue the probable errors of the mean of two nights are ± 0.057 , ± 0.040 , and ± 0.037 .

(2) *The agreement of my measures with the Potsdam catalogue.*—The mean residuals for the different fields range from 0.03 to 0.11, averaging 0.07 (the maximum residual for a single star is 0.24). This is just about the residual which would be expected if the two sets of measures were of equal precision, as the residual 0.07 is the combined accidental error of the two sets of measures.

(3) *The agreement of my measures with the Harvard values.*—The residuals range from 0.05 to 0.28, with an average value of ± 0.15 . If a color correction were applied this would be reduced to 0.14, but would still be double the residual from the Potsdam catalogue. It is realized that great caution should be used in drawing general conclusions from the measures of so few stars; nevertheless, the fact that the residuals from the Potsdam system are persistently (except for S Lyræ) smaller than from the Harvard system seems to admit of but one explanation, the greater accuracy of the Potsdam measures, and the close approach to the Potsdam accuracy in the measures of the present series. The basing of the Harvard measures on polar stars would naturally introduce greater local errors than would be the case in the Potsdam measures, which are based on standards near the measured fields. This doubtless accounts for part of the difference.

TABLE 117.—STANDARD MAGNITUDE STARS. AGREEMENT OF MAGNITUDE RESULTS.

Field.		Residuals between my measures and the catalogue magnitudes.										My measures inter se.		Potsdam Colors.		
		Harvard.				Potsdam.				Mean.		No. nights.	Mean <i>d</i> .			
		1	2	3	4	1	2	3	4	H.	P.					
103	T Andromedæ...	16	19	19	..	7	10	10	..	18	9	3	3	GW-	W-	WG-
267	V Andromedæ...	9	13	8	..	2	4	2	..	10	3	3	2	W-	W-	W
787	W Andromedæ...	6	2	17	..	8	10	7	..	8	8	3	6	GW-	GW-	GW
4315	R Comæ	14	2	11	..	10	12	2	..	9	8	3	6	WG	GW	G-
5798	RU Herculis	13	7	11	..	3	3	8	..	10	5	3	4	GW-	GW-	GW-
6100	RV Herculis	14	16	14	..	1	5	3	..	15	3	3	3	W	WG	WG-
6894	S Lyræ	4	8	3	..	5	9	8	..	5	7	3	3	GW	GW	W
7220	S Cygni	29	18	21	..	18	6	10	..	23	11	3	7	W-	GW-	W
7269	SX Cygni	12	16	12	..	9	15	3	..	13	9	3	5	W	GW	W
7458	V Delphini	27	22	21	..	7	13	11	..	23	10	3	3	GW	WG	WG
8518	Z Cassiopeiæ	32	26	32	20	12	6	11	1	28	10	4	4	WG	G-	
8629	Y Cassiopeiæ	8	15	16	..	6	6	6	..	13	6	3	5	G-	WG	G
Means .....		..	..	..	..	..	..	..	..	15	7	..	4			

PRECISION OF MEASURES WITH THE DIFFERENT APERTURES.

The average residual, expressed in hundredths, of the magnitudes of the measured stars (not including the standards) from the mean of all the nights, is given in the following table for the different apertures separately:

TABLE 118.—MAGNITUDE RESIDUALS FOR MEASURED STARS.

Aperture.		6	12	40	Mean.
103	T Andromedæ...	9	9	11	10
267	V Andromedæ...	8	10	7	8
787	W Andromedæ...	7	4	6	6
4315	R Comæ	8	6	11	8
5798	RU Herculis	8	7	13	9
6100	RV Herculis	5	6	15	9
6894	S Lyræ	4	6	12	7
7220	S Cygni	4	8	18	10
7269	SX Cygni	7	5	12	8
7458	V Delphini	7	6	9	7
8518	Z Cassiopeiae ...	8	7	5	7
8629	Y Cassiopeiae ...	6	5	14	8
Mean		7	7	11	8

II. LIMIT OF VISION OF THE 6-, 12-, AND 40-INCH TELESCOPES.

An interesting result of the present investigation is the photometric magnitude of the limit of vision of the three telescopes used. The estimates of the limit are given for each field in the table "Visual Comparisons of the Variable" in steps below the faintest comparison star visible. Table 119 collects the most reliable of these estimates, made in good seeing and classified for each aperture according to the ocular used, as it is well known that a higher magnifying power will show fainter stars. Following the columns giving the field, date of observation, and estimate of limit, are two magnitude columns on the H. C. O. system, giving the photometric magnitude of the star used in the estimate and the resulting apparent magnitude of the limit, using as the value of one step 0.14. The next two columns give the zenith distance and the reduction to the zenith resulting from atmospheric absorption. The final two columns give the zenith magnitude of the limit, both in the Harvard and Potsdam systems. Using Pogson's formula

Limit of vision = 9.0 + 5 log aperture in inches

we have the following comparison between calculated and observed limits:*

6-inch, calculated.....	12.89.
6-inch, observed, ocular 150.....	12.90 Harvard scale.
6-inch, observed, ocular 150.....	13.02 Potsdam scale.
12-inch, calculated.....	14.40.
12-inch, observed, ocular 275.....	14.27 Harvard scale.
12-inch, observed, ocular 275.....	14.57 Potsdam scale.
40-inch, calculated.....	17.01.
40-inch, observed, ocular 750.....	16.8 Harvard scale.
40-inch, observed, ocular 750.....	17.1 Potsdam scale.

* Compare provisional results from six fields in Table 4, page 10.

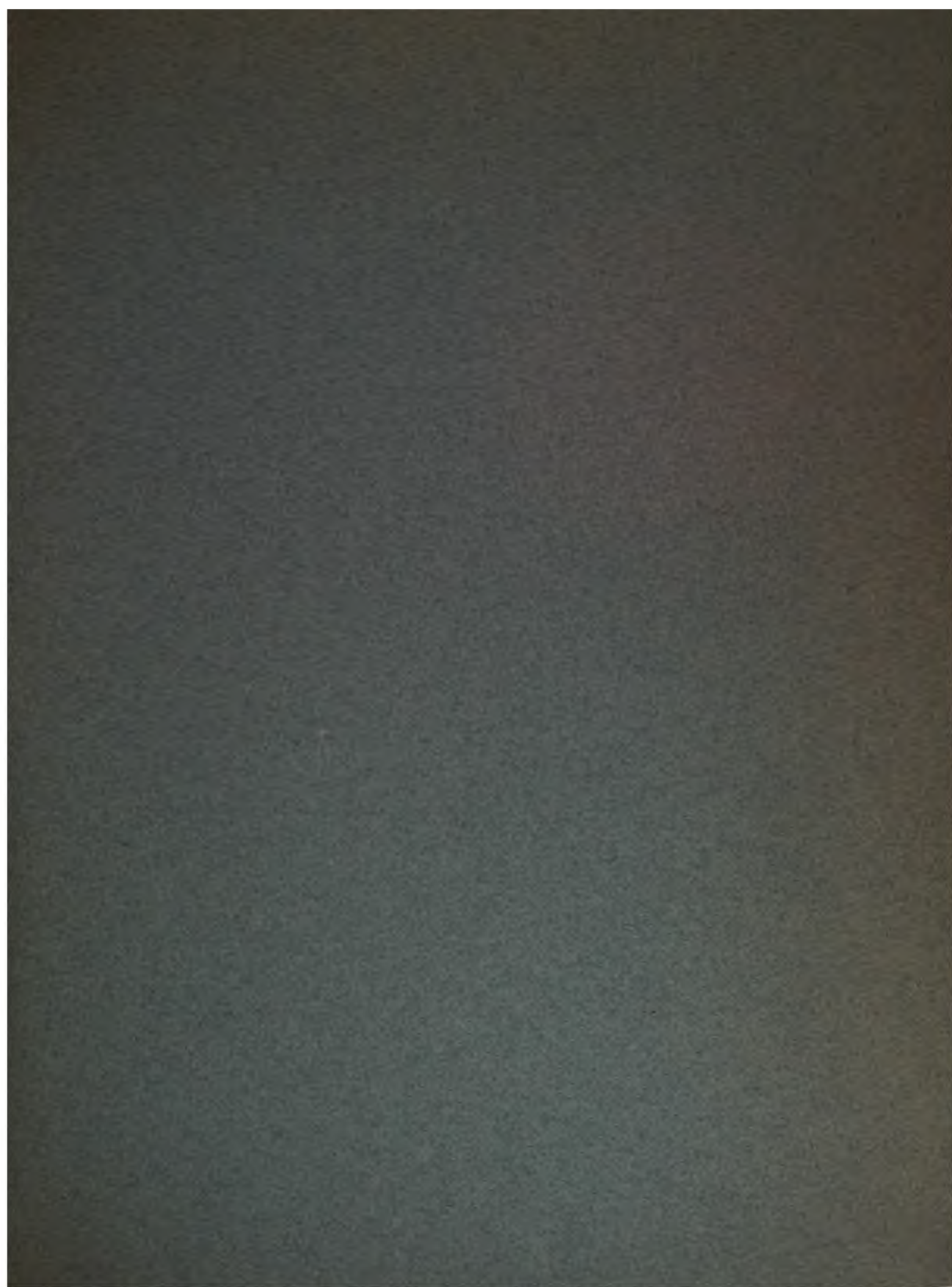
TABLE 119. LIMIT OF VISION.—Continued.

6-INCH, OCULAR 150.								
Field.	Date.	Estimate	Magnitude H.		Reduction.		Corrected Magnitude.	
			Star.	Limit.	Z.	Cor.	H.	P.
T Andromedæ	96 1 13	3 < <i>h</i>	11.85	12.27	30°	.03	12.30	12.38
T Andromedæ	97 9 20	<i>x</i>	13.12	13.12	51	.13	13.25	13.33
T Andromedæ	00 1 24	<i>x</i>	13.12	13.12	40	.06	13.18	13.26
T Andromedæ	97 8 19	4 < <i>h</i>	11.85	12.35	63	.28	12.63	12.71
T Andromedæ	00 9 15	5 < <i>h</i>	11.85	12.55	63	.28	12.83	12.91
V Andromedæ	97 9 20	4 < <i>n</i>	12.24	12.76	56	.18	12.94	13.23
V Andromedæ	97 11 16	5 < <i>d</i>	11.83	12.53	24	.02	12.55	12.84
V Andromedæ	98 1 16	<i>g</i>	12.34	12.34	24	.02	12.36	12.65
V Andromedæ	98 1 18	1 < <i>g</i>	12.34	12.48	24	.02	12.50	12.79
W Andromedæ	99 6 10	1 < <i>h</i>	11.80	11.94	61	.25	12.19	12.60
W Andromedæ	99 7 29	2 < <i>h</i>	11.80	12.08	70	.45	12.53	12.94
W Andromedæ	03 10 11	<i>u</i>	12.42	12.42	52	.14	12.56	12.97
R Comæ	94 5 11	1 < <i>b</i>	12.29	12.43	23	.02	12.45	12.75
R Comæ	05 3 24	<i>u</i>	12.81	12.81	46	.09	12.90	13.20
R Comæ	05 3 24	<i>s</i>	12.83	12.83	46	.09	12.92	13.22
RU Herculis	97 8 20	<i>p</i>	13.42	13.42	34	.04	13.46	13.73
RU Herculis	97 9 14	<i>p</i>	13.42	13.42	40	.06	13.48	13.75
RU Herculis	97 10 14	1 < <i>p</i>	13.42	13.56	55	.17	13.73	14.00
RU Herculis	97 10 23	2-3 < <i>n</i>	12.75	13.10	62	.26	13.36	13.63
RU Herculis	98 8 27	3-4 < <i>m</i>	12.40	12.89	40	.06	12.95	13.22
RU Herculis	98 8 27	2 < <i>n</i>	12.75	12.93	40	.06	12.99	13.26
RV Herculis	97 9 21	3-4 < <i>s</i>	12.67	13.16	26	.02	13.21	13.46
RV Herculis	97 9 25	4 < <i>s</i>	12.67	13.19	26	.05	13.24	13.49
RV Herculis	97 10 14	3 < <i>s</i>	12.67	13.09	36	.05	13.14	13.39
RV Herculis	98 4 26	3 < <i>s</i>	12.67	13.09	58	.20	13.29	13.54
S Lyre	96 12 23	<i>x</i>	12.18	12.18	65	.32	12.50	12.92
S Lyre	97 9 22	2-3 < <i>x</i>	12.82	13.17	21	.01	13.18	13.60
S Lyre	97 11 16	<i>s</i>	12.82	12.82	41	.07	12.89	13.31
S Lyre	97 12 29	<i>s</i>	12.82	12.82	73	.56	13.38	13.80
S Cygni	94 6 6	<i>x</i>	11.95	11.95	48	.11	12.06	12.31
S Cygni	94 6 20	2 < <i>x</i>	11.95	12.23	41	.07	12.30	12.55
S Cygni	94 7 2	2 < <i>x</i>	11.95	12.23	32	.03	12.26	12.51
S Cygni	00 10 26	<i>y</i>	12.31	12.31	16	.00	12.31	12.56
V Delphini	94 6 28	1 < <i>a</i>	12.13	12.27	54	.16	12.43	12.69
V Delphini	94 8 26	2 < <i>a</i>	12.13	12.41	34	.04	12.45	12.71
V Delphini	97 8 27	3-4 < <i>a</i>	12.13	12.62	27	.02	12.64	12.90
V Delphini	99 7 8	4-5 < <i>a</i>	12.13	12.76	49	.11	12.89	13.13
Z Cassiopeia	99 6 10	<i>h</i>	12.99	12.99	40	.06	13.05	12.94
Z Cassiopeia	00 1 1	1 < <i>h</i>	12.99	13.13	18	.01	13.14	13.03
Y Cassiopeia	98 9 7	<i>s</i>	14.01	14.01	32	.03	14.04	13.77
Y Cassiopeia	98 10 5	<i>s</i>	14.01	14.01	32	.03	14.04	13.77
Y Cassiopeia	98 11 5	<i>a</i>	13.53	13.53	24	.02	13.55	13.26
Mean							12.90	13.02

6-INCH, OCULAR 200.								
RV Herculis	99 1 10	3-4 < <i>s</i>	12.67	13.16	56	.18	13.34	13.59
RV Herculis	99 7 8	3-4 < <i>s</i>	12.67	13.16	16	.00	13.16	13.41
RV Herculis	00 1 20	4 < <i>s</i>	12.67	13.19	68	.39	13.58	13.83
Z Cassiopeia	99 1 4	<i>h</i>	12.99	12.99	32	.03	13.02	12.91
Z Cassiopeia	99 10 2	1 < <i>h</i>	12.99	13.13	29	.03	13.16	13.05
Mean							13.25	13.36

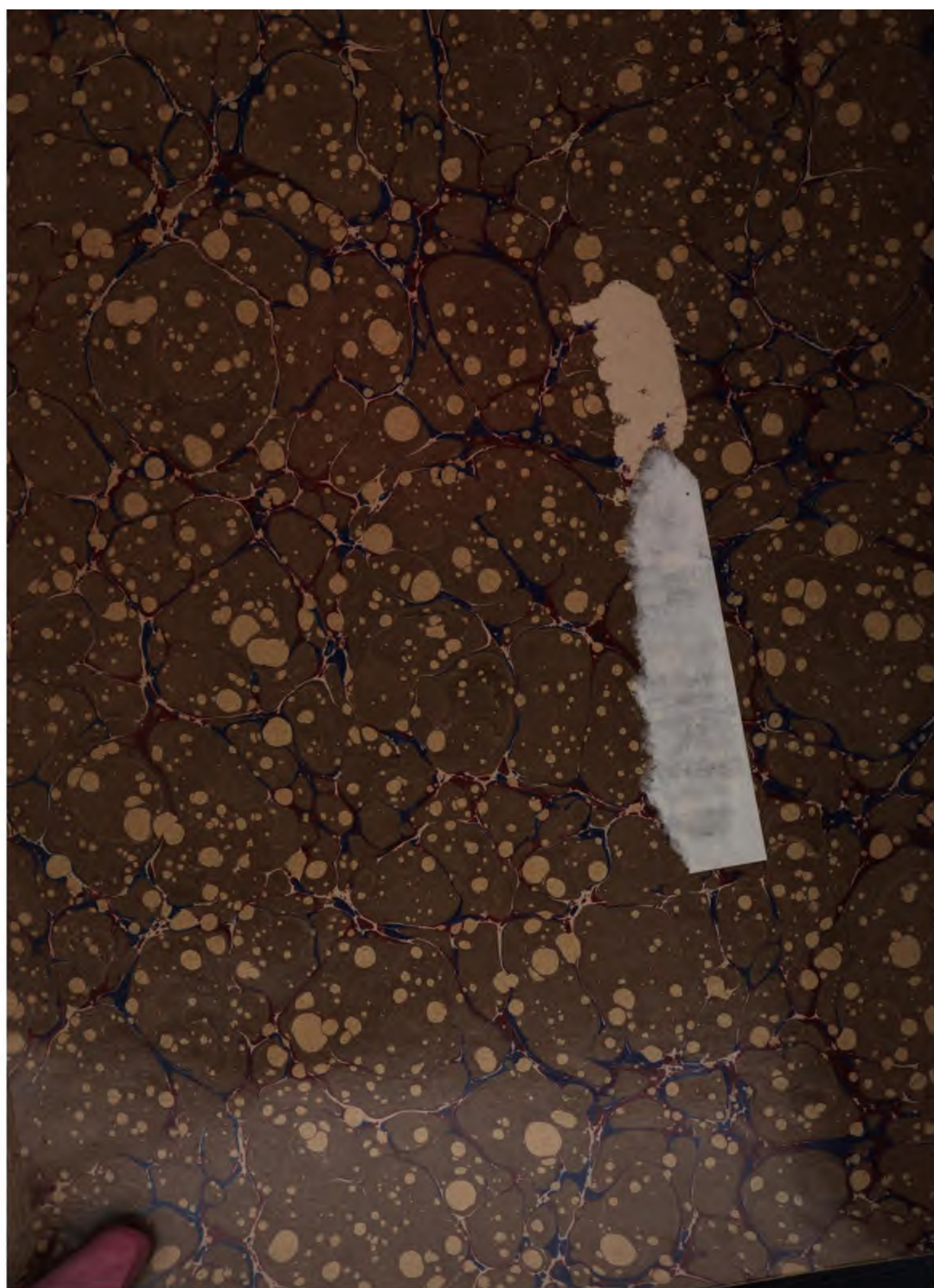
TABLE 119. LIMIT OF VISION.—Continued.

12-INCH, OCULAR 67.								
Field.	Date.	Estimate	Magnitude H.		Reduction.		Corrected Magnitude.	
			Star.	Limit.	Z.	Cor.	H.	P.
RV Hercules	y m d 04 8 11	4 < α	13.30	13.86	26°	.02	13.88	14.13
OCULAR 80.								
W Andromedæ....	03 10 13	z	13.34	13.34	70	.45	13.79	14.20
Z Cassiopeiæ.....	00 2 25	4 < k	12.99	13.55	48	.11	13.66	13.55
Z Cassiopeiæ.....	00 2 25	1 < x	13.38	13.52	48	.11	13.63	13.52
Mean.....							13.69	13.74
OCULAR 275.								
V Andromedæ ...	58 7 25	C	13.82	13.82	46	.09	13.91	14.20
R Comæ	00 4 4	γ	14.17	14.17	34	.04	14.26	14.56
R Comæ	00 4 4	1 < β	14.08	14.22	34	.04	14.26	14.56
RU Hercules	00 3 7	w'	14.68	14.68	40	.06	14.74	15.01
RU Hercules	00 4 4	w'	14.68	14.68	22	.01	14.69	14.96
RV Hercules	00 4 4	β	14.75	14.75	20	.01	14.76	15.01
RV Hercules	00 4 4	η	14.26	14.26	20	.01	14.27	14.52
S Lyræ	00 4 4	8-10 < z	12.82	14.10	41	.07	14.17	14.59
S Lyræ	00 4 4	α	14.01	14.01	41	.07	14.08	14.50
V Delphini	01 11 1	3 < γ	13.50	13.92	51	.13	14.05	14.31
V Delphini	01 11 1	w	13.73	13.73	51	.13	13.86	14.12
Mean.....							14.27	14.57
40-INCH, OCULAR 237.								
V Delphini	02 4 12	4 < A	16.2	16.7	62	.06	16.8	17.2
V Delphini	02 4 12	2-3 < π	15.2	15.6	62	.06	15.6	15.8
Mean.....							16.2	16.5
OCULAR 350.								
RV Hercules	02 2 5	6 < k	15.50	16.25	51	.13	16.38	16.63
OCULAR 450.								
V Delphini	00 10 16	1 ^m < μ	15.3	16.1	34	.04	16.3	16.6
S Cygni	05 11 18	5-6 < δ	15.48	16.25	16	.00	16.25	16.50
OCULAR 750.								
V Delphini	00 8 29	$\frac{1}{2}$ ^m < A	16.2	16.7	51	.13	16.8	17.1











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